

The
Kentucky Geological
Survey

WILLARD ROUSE JILLSON
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The Geography of the
Jackson Purchase
of Kentucky

1923



Plate I. A view of Paducah from the roof of the City National Bank Building. Looking up the Ohio River.

THE GEOGRAPHY OF THE JACKSON PURCHASE

A Study of the Distribution and Activities of Man in the
Gulf Embayment Area of Western
Kentucky



BY

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*Illustrated by 100 Photographs
Maps and Diagrams*

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Preface

The purpose of this study in regional geography is to make an analysis of the conditions of life in the Purchase with a view to the determination of the advantages and limitations inherent in the region. Present conditions will be translated into terms of regional opportunity or handicap where such translation can be made. The historical background will be considered only in so far as it explains existing conditions. Advantageous future development will be indicated along the lines of opportunity afforded by the area.

It is proposed to treat the subject in three parts: Part One consists of a survey of the various factors which constitute the environment, each being evaluated separately. In the consideration of the environment, only those factors which are an aid in understanding the present condition of the area are discussed. Geologic and physiographic conditions are outlined only in so far as is necessary to explain topography, drainage and soils in their bearing on human activities. Climate is described in its bearing on land utilization and occupations. Mineral resources, soils, native vegetation and animal life are considered only as they have some effect on present or future development. The aim of these sections is to fill in the physical background of the region, not in any sense to treat any of these subjects exhaustively or on their own account. A deliberate selection of geographically significant phases of the subject matter determines the limits of discussion. The purpose of the first part is to portray those conditions upon which the present and the future of the area depend and to establish those contrasts in environmental factors which account for the variations in economic response in the various portions of the area.

In Part Two, a division of the entire area into sub-regions is made on the basis of the contrasts in the whole of the environment. These smaller units are utilized for more detailed study and contrast where such treatment aids in an understanding of the problems of the present or the opportunities for future development.

Part Three is a survey of economic conditions as they exist today and an explanation of present conditions with particular emphasis on the opportunities offered by the environment and on the local handicaps. In cases where the present condition is due to the persistence of institutions, the necessity for which has vanished with changes induced by time or an altered environment, the introduction of a limited historical background is necessary. In the Purchase, which has occupied an eddy in the westward stream of migration and progress, there are many such adjustments to a past period, a characteristic occurring frequently in all retarded areas.

In this third part, the use of the land, highways and transportation, mining and the industries dependent upon the mineral resources, manufactures, and cities are discussed. Consideration is also given to an analysis of the changes in number, distribution, and character of the population and to the significance of such changes, together with a general survey of the distribution of wealth.

Such a study should enable a summarization of the problems of the area and point the way for a forecast of desirable lines for the future development of the region along the avenues of opportunity afforded by the environment.

The western extremity of the state constitutes a single geographic unit. Industrial development has not as yet been so extensive as to complicate excessively the responses to environment, though human occupation has persisted for a period of sufficient length to bring out maladjustments to present economic opportunities. These conditions make the area a fortunate choice for the first geographic study to be undertaken under the auspices of the Kentucky State Geological Survey.

The field work was done during 1921, the summer being spent in visiting different parts of the area and in collecting data as to economic conditions. Viewed from the standpoint of an outsider, many conditions in the Purchase had a significance not attached to them by the residents. It is hoped that this newness of viewpoint, added to the familiarity with the region produced by the summer's field work, together with the subsequent opportunity afforded for the unification of impressions, will aid in drawing a true picture of actual conditions. This

picture will be incomplete in that it will not convey to the reader the accomodating spirit of the people and their never failing courtesy.

It is difficult to acknowledge properly all the assistance which was extended in the prosecution of this work, but mention should be made of the aid given by the officials of the various transportation lines, the managers of the clay pits, potteries and brick plants, the county agricultural agents, the various representatives of the tobacco trade, and the many other individuals whom it is impossible to name separately. Special acknowledgment is due to Dr. W. R. Jillson, Director and State Geologist, for his co-operation in the furtherance of the work, and to Professor C. O. Sauer of the University of Michigan for his many and helpful suggestions.

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THE GEOGRAPHY *of the*
JACKSON PURCHASE

PART I



THE ENVIRONMENT

CHAPTER I.

INTRODUCTION

"THE JACKSON PURCHASE"

The eight counties of Kentucky which lie west of the Tennessee River comprise the Kentucky portion of what is commonly known as the "Jackson Purchase" or the "Purchase," because of the manner of its acquisition. (13) Authorization for the purchase of the territory from the Chickasaw Indians was given as early as 1816, but it was not until October 19, 1818, (19) that the government acquired the tract. (3a) As General Jackson was the leading spirit in the negotiations with the Indians, his name is commonly associated with the purchase in the designation of the area. (14)

SPACE RELATIONSHIPS

Of the area acquired, a total of 2396 square miles lies in Kentucky (2). This is approximately 5.7% of the total area of the state. Only on the south is it necessary to establish an arbitrary line to mark the boundary. To the east, the Tennessee River furnishes a natural dividing line between the Mississippi Embayment Area and the Southwestern Lower Carboniferous Plateau. On the north and west, the Ohio and Mississippi rivers form the boundaries, separating Kentucky from the states to the north and west of the two rivers.

The north boundary follows low water on the right bank of the Ohio River, for in the act by which Virginia relinquished her claim on the Northwest Territory, she still retained control of the Ohio. (1) The western boundary, the oldest in time of establishment of any of the Kentucky boundaries, follows the middle of the Mississippi River in accordance with the terms of the treaty of 1763. This boundary was reaffirmed by the treaty of 1783. Subsequent changes in the channel have not affected the boundary. (4) Division of the islands in the river has been made on the basis of the location of the channel in 1783, islands Nos. 1, 2, 3, 4, 5 (Wolf Island), and 8 being given to Kentucky by the Act of 1820. (1)

Numbers in parentheses refer to the chapter bibliography at the end of the chapter.

The parallel of $36^{\circ} 30'$, the westward extension of the southern boundary of Virginia, was made the southern boundary of the state, but due to inaccuracies in the early survey, caused by difficulties attendant upon work in a new country and by the failure to make the proper corrections for compass variation, the state line departs measurably from the parallel, the departure in the Purchase reaching a maximum of slightly over half a mile to the east of Reelfoot Lake. West of Reelfoot Lake, the boundary is the so-called Compromise Line. (1)

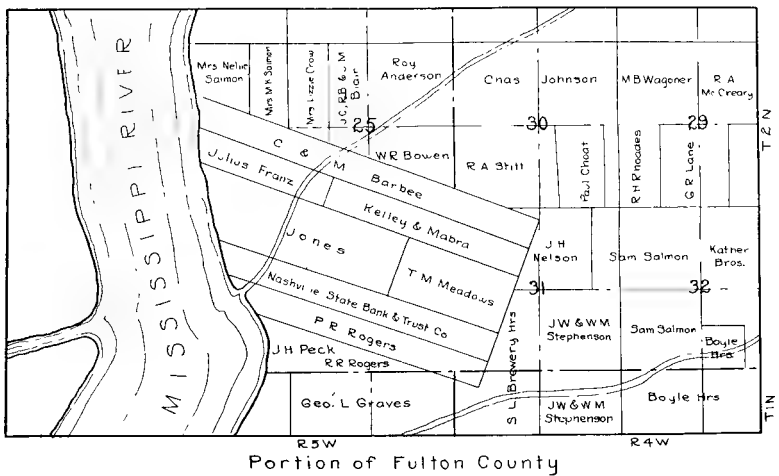


Fig. 1. A portion of Fulton County, showing the rectangular farms and the irregularities introduced by early surveys.

This is the only portion of Kentucky in which the land is laid off in sections, as it is the only portion acquired and settled since the introduction of the system of land survey used in the Northwest Territory. Fig. 2 shows the location of the base line and the principal meridian and the numbering of the townships and sections. This system of survey has produced a generally rectangular pattern in the farms, though there have been some departures from this shape due to the fact that many of the roads do not run on section lines. Early surveys and military grants in a few counties have also introduced some departures from the system, with the result that some land is described by metes and bounds. Some of these irregularities introduced by

the early surveys are shown in Fig. 1. In general, however, the description of the land is simple, the situation being much better in this respect than in any other portion of Kentucky. (12)

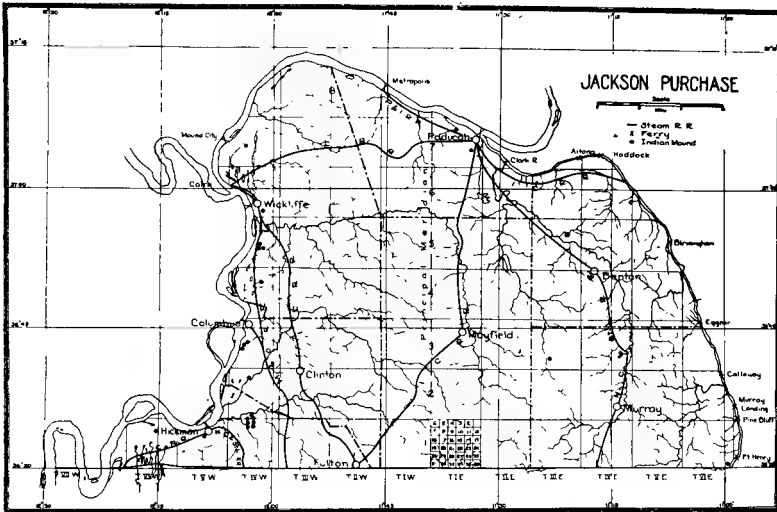


Fig. 2. A map of the Purchase showing the numbering of townships and sections, the principal ferries, the railroad lines and the location of Indian mounds.

The location of the Purchase is such that it is easy of access from adjacent areas. The river boundaries are all navigable streams, the significance of which as highways was apparently appreciated even in prehistoric times by the Mound Builders, whose structures (6) are contiguous to the larger stream courses. (11) (See Fig. 2.) At a later date, these river boundaries were the highways frequented by explorers of various nationalities and later still were traversed by settlers on their way to seek homes in the western country. (18) In spite of the easy accessibility, the Purchase remained an island of unoccupied land until the early portion of the nineteenth century because of Indian ownership.

Located approximately midway between the Great Lakes and the Gulf, and in a region of slight relief, railroads as well as rivers contribute to the accessibility of the area. The old focus of waterways, which the area represents, early attracted railroad lines, either competing with or supplementing the water

routes. The Mobile & Ohio and the Nashville, Chattanooga & St. Louis had original terminals in this area, and the Illinois Central had terminals immediately to the north of the Ohio.

Shortly after acquisition from the Indians, the territory was organized as Hickman County, with the county seat at Columbus, where the Mississippi River swings against the bluff. By successive subdivisions, as tabulated on the following page and shown in Fig. 3, the present eight counties have originated. (3)

The counties of this portion of Kentucky, by excessive subdivision, have dropped below the state average in size. Kentucky counties are in general too small for economical and efficient administration. Furthermore, there is a great variation in the size of the counties. Graves County, the largest in this group and one of the eight largest in the entire state, has an area of 550 square miles, according to the Fourteenth Census. At the other extreme as to size is Fulton County with an area of only 193 square miles and Carlisle County, which embraces 198 square miles, two of the smallest counties in the state. In the case of Fulton County, the situation is aggravated by the fact that the county is over 30 miles long, but averages less than six miles in width, with Hickman, the county seat, located on the Mississippi River at one end of the county, in such a position that it is difficult of access by road during the wetter portion of the year, and in the absence of an east and west railroad line in the county, impossible to reach by rail except by a roundabout route.

The first four counties were, logically enough, large counties, dividing the area into approximately equal portions. Further subdivision has reduced all counties in size, with the exception of Graves County, which still retains its original area. In part, this tendency to subdivision may result from poor roads, which render remote sections of a county inaccessible, but it is probably in larger degree the result of a desire on the part of politicians to increase the number of public offices. This duplication of offices has needlessly increased taxes and has prevented economical administration. A readjustment of county lines and a reduction in the number of counties is much to be desired.

Names of counties in order of formation.	Area in sq. mi. of county as formed.	Area in sq. mi. of present county.	Present counties embraced in county as originally organized.	Rank in State of present county on basis of area.	Date of formation of present county.	Counties from which formed.	Original county seat.	Present county seat.
Hickman	2396	225	Hickman Calloway Graves McCracken Marshall Ballard Fulton Carlisle	95th	1821	Caldwell Livingston	Columbus	Clinton
Calloway	739	412	Calloway Marshall	31st	1822	Hickman	Wadesboro	Murray
Graves	550	550	Graves	8th	1823	Hickman	Mayfield	Mayfield
McCracken	491	239	McCracken Ballard	89th	1824	Hickman	Wilmington	Paducah
Marshall	327	327	Marshall	57th	1842	Calloway	Benton	Benton
Ballard	450	252	Ballard Carlisle	87th	1842	Hickman McCracken	Blandville	Wickliffe
Fulton	193	193	Fulton	107th	1845	Hickman	Hickman	Hickman
Carlisle	198	198	Carlisle	104th	1886	Ballard	Bardwell	Bardwell

Average area of the 120 counties in the entire state, 334 sq. mi.

Average area of the counties in the Purchase, 299.5 sq. mi.

Data as to areas from 14th Census.

Dates of formation of counties: Collins, Richard H., History of Kentucky, Vol. II., p. 26. Kentucky Hand Book, 1907, State Dept. of Agr.

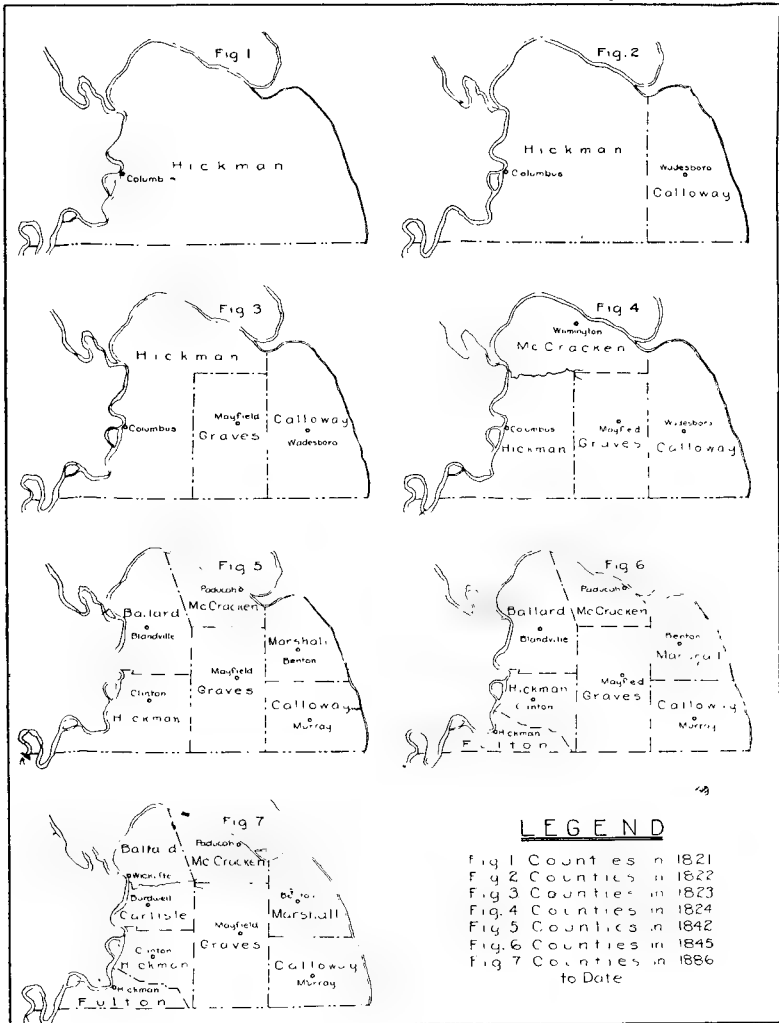


Fig. 3. Development of the counties of the Purchase and changes in the county seats.

PHYSICAL FEATURES

The surface of the portion of Kentucky under discussion varies from a very flat flood plain bordering the larger rivers and their tributaries to a gently rolling or even hilly upland. In some cases, the interstream areas are flat, but generally the

land surface is rolling or moderately hilly, with the higher hills on the margins of the valleys of the larger streams. These valleys vary from a fraction of a mile to several miles in width, large parts of which are present-day flood plains. In most of the valleys, there also persists the remnant of a flood plain developed at a higher level and not now subject to overflow. These higher, older flood plains are commonly known as "second bottoms." They are separated from the present day flood plains or "first bottoms" by a well developed scarp from five to twenty feet in height, this division being particularly sharp and well marked along the larger streams.

The average elevation above tide is somewhat less than 400 feet, most of the surface lying between 350 and 400 feet above sea level. The greatest elevation is attained in Calloway County, where elevation above tide of 600 feet and over are reached in the ridge which extends from the Tennessee line, gradually decreasing in elevation, to the north. This is the northern continuation of the "Tennessee Ridge" of Safford. (5) With an average elevation of between 450 and 500 feet above sea level, it extends northward parallel to the Tennessee River and from ten to twelve miles west of it. In Kentucky, as in Tennessee, drainage east of the ridge is into the Tennessee River. The shortness and steepness of the eastern slope have resulted in the development of a very hilly section to the east of the ridge because the short, swiftly flowing streams of the eastern slope have thoroughly dissected the land surface.

Aside from the first and second bottoms, the only portions which are distinctly flat are surfaces underlain by the Porter's Creek clays, locally known as "soapstone." In Mississippi, the areas underlain by this clay are almost universally flat, so that the clay is commonly known as the Flatwoods clay and the surface underlain by it as the "Flatwoods." (5) In the Purchase, two small sections, one in Calloway and another in Marshall County, have this same flat surface and are likewise locally called "Flatwoods."

The uplands terminate at the west in a line of bluffs which overlook the alluvial bottomlands of the Mississippi and Ohio rivers. On these bottoms, which constitute the flood plains of the rivers, occasional low ridges rise above the general surface

of the plain to a height sufficiently great so that they are not commonly submerged by floods. Intersecting the plain are numerous narrow sloughs which often connect small ponds or lakes. The higher land along the river front, the so-called "front land," (9) and the higher ridges more remote from the stream are the only portions of the bottoms which are cleared and cultivated except where levees have been constructed to restrain the river floods. Near the bluffs, the land is low and swampy.

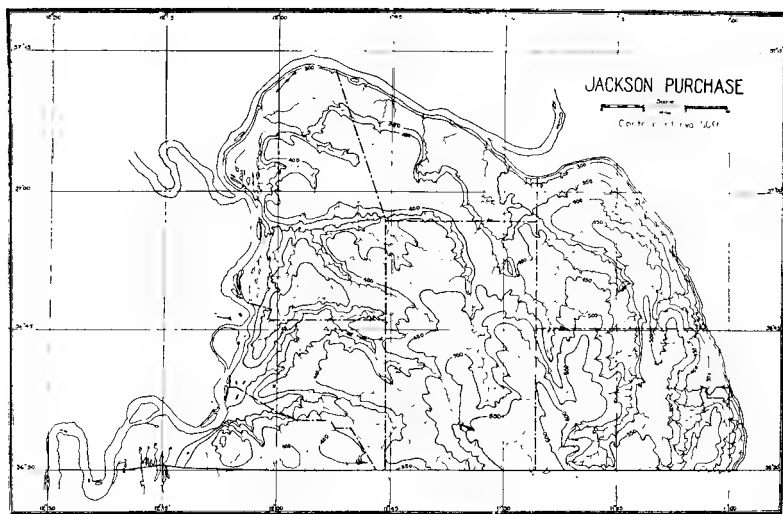


Fig. 1. Topographic map of the Jackson Purchase. (After U. S. Geol. Surv., Water Supply and Irrigation Paper No. 164 and Tables of Elevations in Series IV, Vol. I, Part II, 1913, Ky. Geol. Survey.)

West of Tennessee Ridge, the general slope of the land is toward the Mississippi River, though this is true only in a general way as the more noticeable slope is always toward the drainage channel which carries off the local rainfall. None of the smaller streams have a great fall, their flood plains quite commonly being undrained cypress swamps.

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CHAPTER II.

ROCK FORMATIONS AND THEIR RELATION TO SURFACE

ROCK FORMATIONS

In North America, the late Cretaceous period of geologic time was marked by an encroachment of the sea on the land, western Kentucky, southern Illinois and southeastern Missouri being covered by a northern extension of the present Gulf of Mexico. This condition persisted during the early part of the Tertiary period. (8)

The formations deposited during this long period of sedimentation are generally unconsolidated and consist of sands, gravels and clays ranging from Cretaceous to Quaternary in age, though the process of sedimentation was not continuous. The lower portions of the sand layers, if overlying impervious clays, are often locally consolidated by the cementing action of iron oxide, carried by descending water and checked in its descent by the clay. These cemented layers, however, rarely exceed two feet in thickness. Ironstone conglomerates of similar origin are also of frequent occurrence. Like the sandstone, the ironstone conglomerates rarely offer serious difficulty in well drilling. (7a)

The formations represented in the Kentucky portion of the Mississippi Embayment, named in order from the ancient shoreline westward, are the Ripley formation of Cretaceous age, the Porter's Creek clay and the La Grange formation of Eocene age, the Lafayette formation of Pliocene age, the Columbia loam and the Loess of the Pleistocene and Recent alluvium. All of the embayment deposits rest on a floor of Paleozoic age (7b)

THE PALEOZOIC FLOOR

Our knowledge of the Paleozoic floor underlying the deposits of the period of embayment is based on observations of outcrops in a narrow belt immediately to the west of the Tennessee River and in comparable areas in other states, together with the few available records secured by drilling. In Kentucky, the floor

Numbers in parentheses refer to the chapter bibliography at the end of the chapter.

seems to be uniformly of Mississippian age. Deep drilling encountered the Mississippian rocks at a depth of 324 feet at Paducah. Farther west in McCracken County, at La Center, the same formation was reached at a depth of 387 feet. At Cairo and Mound City, both in southern Illinois, the Mississippian chert or Elco gravel, as it is locally known, was reached at depths of 525 and 605 feet respectively. (7b) At Wickliffe, on the Mississippi River, the Mississippian was reached at a depth of a thousand feet. The southwestern dip of the floor from Paducah to Hickman carries the limestone to a depth of over 2,000 feet at the latter place as has been shown by recent borings for oil in the Reelfoot Lake vicinity near Bondurant. (13) The depth of the floor and its surface configuration are of significance in connection with water supply problems and with the exploratory work which has been done in the search for oil.

The dip of the floor upon which the embayment sands and clays lie is to the west in Tennessee, but in Kentucky, the dip changes to the southwest, and in southern Illinois, to the south. Farther west, in southeastern Missouri, the dip is to the south-east. Upon this "spoon-shaped" (7c) rock floor were deposited the sands, gravels and clays of the northern portion of the embayment area, consequently their dip corresponds to the dip of the floor, though somewhat steeper near the outcrop than farther out on the floor. (7d)

THE MISSISSIPPIAN SHORE

Bordering the Tennessee River, and extending through Calloway and nearly to the western margin of Marshall County, is a belt from three to five miles in width, underlain by Mammoth Cave limestone of Mississippian age. During the long interval between the end of the Pennsylvanian period and the present, the agents of denudation lowered the surface and carved the landscape of today. The limestone, being soluble, disappeared; only the more resistant chert remained to form the present surface and conceal the underlying limestone from which it was derived. Rock exposures are rare, even on the steep, flint strewn slopes. This section, with its stony hills and sandy bottoms, is one of the poorest agricultural areas of western Kentucky.

THE RIPLEY FORMATION

The Ripley sands, which extend in a belt from four to eight miles in width, roughly parallel to the Tennessee River and separated from it by the narrow strip of Mississippian, are red, pink, or yellowish brown as surface exposures, but are often gray at depths where not oxidized. They are usually soft and incoherent, with occasional induration by iron. Associated with the sands are lenses of slate colored clays which are often highly lignitic in character, thereby indicating a fresh or brackish water origin for the deposits. The lignitic layers may reach a thickness of several feet and are reported to be used occasionally as fuel, though not of any commercial significance for that use. (15a)

The hilly topography and the thin and often sandy soils make this a poor agricultural section, much of the land on the steeper slopes being valueless for crop production. The clay lenses of the formation furnish material suitable for making common pottery such as earthenware jars, jugs, churns and other similar articles, constituting the basis for the existence of the small potteries which were established at a very early date.

PORTER'S CREEK FORMATION

The Porter's Creek clays rest unconformably upon the Ripley sands (7e), outcropping to the west of the belt where the sands appear at the surface. In Kentucky, the belt of outcrop of the clays reaches a maximum width of ten to twelve miles in northern Calloway County, narrowing as it curves to the west and crosses McCracken County.

The formation is mainly a clay, but contains, imbedded in the clay, layers of fine sand, and in the lower part, green-sand or glauconite, which occasionally contains enough calcareous material to cement certain layers into an impure limestone. (7f) The clays, which attain a thickness of 100 to 160 feet, are dark gray to black when wet and light gray when dry. Locally they are known as "soapstone." Associated with the formation are sandstone dikes, some of which show slickensiding. (7g)

No deposits of economic importance occur in this formation, even the water obtained from shallow wells in the areas of out-

crop being unfit for domestic use. (7h) Outcrops, except along the stream courses, are rare. In no place does it form the actual surface, and except in two small areas, the "Flatwoods," it has no noticeable effect upon the topography.

THE LA GRANGE FORMATION

Of all the formations which occur in the Purchase, the most extensive as well as the thickest is the La Grange. Its sands and clays cover approximately 1,600 square miles or two-thirds of the area. Though extensive, it forms but a small percentage of the actual surface, being covered on the upland by a variable thickness of Lafayette gravel, Columbia loam and Loess. On the Mississippi bottoms, where the overlying formations have been removed, the alluvium rests directly on La Grange sands and clays. (7i) Though not forming predominantly the actual surface in the region of its occurrence, exposures in stream valleys and railroad cuts are frequent, as the overlying layers are not thick.

Interbedded sands, clays and lignitic material make up the deposits. The larger part is cream colored or light orange cross-bedded sand, usually fine grained, though occasionally coarse sand or gravel occurs.

The clays are of considerable economic importance, these being the principal pottery clays mined in the Purchase. They occur as plastic, siliceous clay lenses, embedded in the sands. Many are pure white in color; other layers are highly lignitic and contain many fossil plant remains. Locally, the lignitic layers may reach a thickness of fifteen feet and may contain very little clay.

The sands, because of their closeness to the surface, are readily reached by wells which furnish an abundant supply of good water where the sands are not so fine that they clog the strainers. As this formation underlies such a large percentage of the surface, it is the most important of all the formations as a source of water. (7j)

THE LAFAYETTE FORMATION

Covering all the previously described embayment deposits as well as portions of the Mississippian, and resting unconforma-

bly upon the La Grange, is a layer of ferruginous sand and gravel of an average thickness not exceeding twenty feet. This deposit thins out and disappears in some places and increases in others to a maximum thickness of forty feet. Wherever the basal portion of the Lafayette is gravel, the unconformity between it and the La Grange is easy to detect, but when the materials of both beds are similar in character, it is difficult to determine the contact.

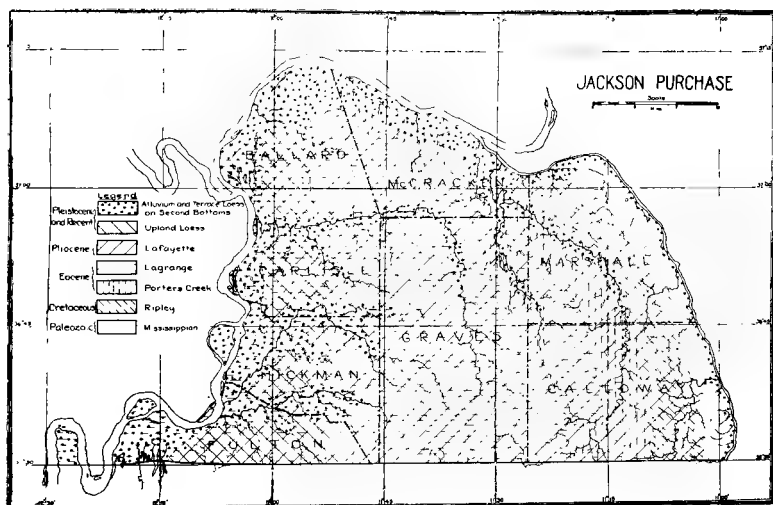


Fig. 5. Geological map of the Purchase. (After R. H. Loughridge and L. C. Glenn.)

The formation (16) is composed largely of an orange or brick red sand, often much indurated. In places it is massive and again it shows stratification or cross-bedding. The gravels which compose part of the formation are specially prominent near the larger rivers, the gravel being not only more abundant but composed of larger pebbles. Most of the pebbles are chert, stained brown by iron. There are also pieces of sandstone, quartzite and vein quartz, but no pebbles of granite or other rocks of northern origin. (7k) The appearance of the formation in the Purchase would indicate a fluvial origin for the deposits. Due to the abundance of ferruginous material, the gravel is often cemented into a compact conglomerate, especially in the

basal layers. Locally, depressions in these cemented basal layers serve as basins from which shallow wells derive a supply of water. (71)

PLEISTOCENE AND RECENT DEPOSITS (1)

The previously described formations in few cases form the actual surface, and where they do, the use of the land for agricultural purposes is affected adversely. These underlying formations are important mainly as they determine topography and drainage or because they contain deposits of economic importance. Over most of the embayment formations is spread a mantle of Columbia loam or Loess on the upland and of alluvium on the river bottoms. These form the actual land surface over the greater portion of the Purchase.

LOESS

Eastward from the bluffs along the Mississippi and Ohio rivers, a belt from eight to fifteen miles in width is covered by loess to a variable depth. At the western margin, it may reach a maximum of a hundred feet or more, completely concealing the Lafayette, except along streams, but to the east it thins out and gradually disappears, the exact eastern boundary being impossible of determination. This belt is widest in Fulton County and gradually decreases in width to the north. This loess covered area constitutes the best upland agricultural section of the Purchase, and in it has developed the most advanced type of agricultural practice found in this portion of the state.

Where exposed in roadside cuts, it is typically porous and ash gray in color, standing in vertical faces which are frequently somewhat obscured by the slumping of the surface soil. In these areas, during periods of dry weather, every roadside tree and bush is covered with fine dust which rises in clouds with the passage of vehicles. On drying after rains, the rutted roads ride smoothly, the irregularities smoothing out and crumbling to fine powder which the wind then distributes over surrounding objects.

The exact origin of these deposits is somewhat in dispute, but it is probable that they were formed for the most part during that period when southern Illinois was covered by ice and that

the material which makes up the deposit is finely ground rock flour of glacial origin. (9) The agent which carried the rock flour to its present location may have been either wind or water, either agent being capable of transporting the material. The weight of the evidence, however, indicates an eolian origin.

COLUMBIA LOAM

Where loess occurs, it is commonly overlain by a thin veneer of different loam. This same loam extends to the east beyond the limits of the loess as a thin mantle over the Lafayette. Though the thickness increases to the east, it rarely exceeds ten or twelve feet at any place, and in the hills bordering stream courses, it is only a few inches thick. It gradually disappears to the east in Marshall and Calloway counties. This may be due in part to the hilly topography which has allowed the removal of the larger portion of the layer by slope wash. The exact origin of this formation is somewhat uncertain.



Plate II. A thick layer of Columbia loam, west of Fancy Farm, Graves County. Iron crusts show in the underlying Lafayette.

This is one of the most significant of the formations from the standpoint of its effect upon the use of the land, as it forms such a large percentage of the actual surface. It also constitutes an industrial resource, as the clays, after the removal of the top soil, make excellent brick and sewer tile.

RECENT ALLUVIUM

Between the Mississippi River and the bluffs which limit its valley, there is a flood plain which has been built since the deposition of the loess on the uplands to the east. These alluvial deposits, which reach a considerable thickness, rest upon the La Grange sands, as the cutting of the Mississippi River has



Plate III. Thin layer of Columbia loam over Lafayette gravel. In the hills of southwestern Graves County.

completely removed the Lafayette and other overlying formations as well as the upper portion of the La Grange. (7m) A similar flood plain borders the Ohio River and a much narrower one has been formed by the Tennessee. The principal tributaries of the Mississippi, such as Mayfield Creek, Obion Creek, and Bayou de Chien, have similar flood plains in their lower courses.

Alluvial deposits are still forming because the flood plains are still subject to overflow. Near the river, the deposits are sands and silts. At some distance away from the river, they pass into dark colored clays of high organic content. Where not protected by levees, these flood plains are subject to overflow and consequently are swampy and uncleared in large part. When properly drained, the alluvium constitutes one of the best soil types of this section.

ORIGIN OF THE TOPOGRAPHY

Disregarding minor inequalities produced by stream action, the land surface represents a plain of marine deposition formed beneath the waters of the Gulf of Mexico when it extended into southern Illinois. Subsequently, these marine deposits were uplifted, with some local tilting or warping but no folding of strata. This action has been most pronounced near Reelfoot Lake. (7n)

CRUSTAL MOVEMENT AND RIVER WORK

The presence of sandstone dikes in the Porter's Creek clays affords evidence that this region underwent changes in level during late Eocene time. (7o) Subsequent crustal movement within the memory of man occurred at the time of the New Madrid earthquake in 1811 and 1812. (2) It is highly probable that elevation has occurred at various other times. These movements have produced the larger topographic features which are not explainable on the basis of differential erosion.

At no place do elevations greater than 350 feet above low water in the Mississippi River at Hickman exist. Valleys are, therefore, not excessively deep. On account of the soft and unconsolidated material in which the rivers have worked, the vertical cutting was soon completed and valley widening begun, so that today the principal streams possess flood plains several miles in width.

The higher, older flood plains, which are commonly known as "second bottoms," were apparently perfected toward the close of the invasion of the Wisconsin Ice, when the Mississippi drainage was choked with water from the melting ice to the north. (20) Along the Ohio and Tennessee, the second bottom is from 25 to 35 feet higher than the present day flood plain, and is separated from it by a distinct escarpment. At Paducah, which is located on the second bottom of the Ohio, the deposits consist of 30 to 40 feet of silty sand and clay overlying 20 to 30 feet of "cement gravel" composed of pebbles, some of which are four or five inches in diameter. (7p)

With the disappearance of the ice to the north and the restoration of normal drainage conditions, the streams trenched the unconsolidated materials of the second bottoms, established

themselves at a lower level and began the construction of a new flood plain, the first bottoms of today. These present day flood plains vary in width from a few hundred feet to a mile or more and in places rise 25 feet or more above low water stages in the rivers.

Dissection has been most active near the principal lines of drainage, and it is in these areas that the longest and highest hills occur. In all portions, however, if stream dissection has progressed very far, the country has been converted into a maze of short, steep hills. An excellent example of the effect of stream activity is afforded by southeastern Calloway County, where the Blood River and its tributaries have thoroughly dissected the area.



Plate IV. In the hills of southeastern Calloway County near New Concord.

EFFECT OF GEOLOGICAL STRUCTURE ON TOPOGRAPHY

Four different formations have been especially effective in the determination of the minor relief features. These are the Loess, the Ripley sands, the clays of the Porter's Creek formation and the Mississippian chert.

The Mississippi River bluffs rise abruptly from the flood plain to a height of 100 to 180 feet. These bluffs are trenched by narrow ravines of great depth whose vertical sides are prevented from weathering back by the capping of loess. This loess

stands in vertical faces as it does under similar circumstances in the Mississippi River bluffs. The narrow ravines which dissect the upland in the vicinity of the Mississippi are locally known as "Gulfs" and the hills produced by the dissection are known as the "Cane Hills." (15b)

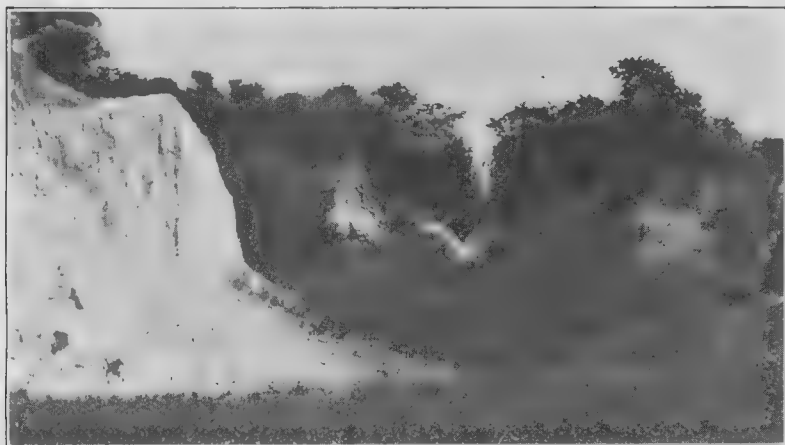


Plate V. A "Gulf" in the Mississippi bluffs at Columbus.

Erosion in the area of outcrop of the Ripley sands has resulted in the production of a very hilly topography for which the Ripley sands are largely responsible. Although drainage channels develop rapidly in such an area, after such a channel has once been established, the hills do not waste away rapidly in this type of climate. The rain falling on the surface is readily absorbed by the porous sands so that it sinks in instead of effecting soil wash on the steep slopes. Streams originating in the valleys where the ground water reaches the surface, deepen their channels and produce hills of increasingly steep slope, but the summits of the hills are not lowered because the hilltops are free from surface rivulets during rains. (7q) As these hills are largely in forest, the tendency to soil wash is still further decreased. A similar absence of slope wash may be observed in other areas on the steep slopes of sand dunes which are at rest.

In contrast to the hilly outcrop of the La Grange sands, and immediately to their west, are the flat areas underlain by the Porter's Creek clay. In such areas, the rain runs off as surface

streams, consequently surface inequalities disappear instead of being intensified as in the hilly area of the La Grange sands. (7r)

West of the Tennessee River, in the area underlain by Mississippian limestones, the concentration of chert has developed a topography characterized by relatively wide bottoms flanked by steep sided hills. Through these bottoms the streams flow in wide, shallow beds which apparently contain no water during the dry season except for a few detached pools. The stream beds are paved with flat cherts and similar fragments litter the surface of the roads. The chert is singularly resistant to weathering, so that in this older area, which has been subjected to sub-aerial erosion for thousands of years, it has accumulated in enormous amount, and the tree-clad hills consist essentially of chert fragments imbedded in a matrix of soil. Only in the wide and rather sandy bottoms is there soil enough for successful agriculture. In this region, there is a development of underground drainage channels and of surface depressions or sink holes which mark the collapse of the roofs of underground caverns. In some cases, water stands in these surface depressions, as in the ponds in Marshall County near the junction of the two forks of Bear Creek. (15c)

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CHAPTER III.

CLIMATE

The climate of the Purchase is of the humid continental type. Neither areal extent nor relief are sufficiently great to cause differentiation of climate, nor is the topography varied enough to introduce important contrasts within the area. Slight variations in average precipitation and temperature shown by the several stations are more largely due to local exposure of the instruments and the relative length and time of the record than to climatic differences.

WINDS AND STORMS

Western Kentucky lies well within the path of the moisture-bearing storms which move from the western Gulf region northeastward over the Ohio Valley to the North Atlantic coast, but too far south to be much affected ordinarily by the storms which originate in the Northwest. The temperature variations and the greater part of the rainfall are caused by these general storms which vary greatly in frequency, character and force. (1)

Occupying, as the Purchase does, a location on the southern margin of these general cyclonic storms, prevailing winds for the year and most of the months are from the south and southwest, though during the colder portion of the year, north and northwest winds frequently predominate. At Blandville, with a twenty-seven year record, the winter winds are prevailing from the northwest, due to the southward winter shift of the storm tracks, but the common summer winds are from the southwest. At Paducah, where the record is available for twenty-two years, the winds are from the south eleven months in the year, February alone being characterized by northerly winds. The prevalence of northerly winds increases in the northwest section in which Blandville is located, while southerly winds more largely prevail to the south and east. The country is sufficiently rolling and hilly to afford some protection from harsh winds, differing materially in this respect from the prairie sections.

All data in this chapter are from the various publications of the U. S. Weather Bureau listed in the chapter bibliography at the end of the chapter.

Numbers in parentheses refer to the chapter bibliography at the end of the chapter.

Average wind velocities are not high, the annual mean varying from eight to nine miles per hour, with a winter maximum seasonal mean of between ten and eleven miles per hour and a summer minimum seasonal mean which varies from six to seven miles per hour. This greater wind velocity in winter is the result of the more pronounced development of the cyclonic storms during the winter season, and to a lesser extent, may be due to the shift of the storm tracks.

Due to the location of the Purchase on the southern margin of the cyclonic storms which move eastward over the Ohio Valley, severe cyclonic thunderstorms, sometimes accompanied by hail, occur rather frequently during the spring and summer months. The average number of such thunderstorm days is between forty and fifty per year, this number being exceeded in only one area in the United States, the Missouri-Nebraska region. The Florida thunderstorms are not comparable as they are "heat" thunderstorms which are not so violent and do not persist for so long a time. (3)

Tornadoes are rare, but the thunderstorms are occasionally associated with destructive windstorms which damage buildings and crops. As regards damage by destructive winds associated with thunderstorms, the risk for any specific area is small. It is interesting to note, however, that the outside cellars which function mainly as places of storage in the absence of basements under the houses are often referred to locally as "cyclone cellars."

TEMPERATURE CONDITIONS (1) AND (6)

The mean annual temperature is slightly over 60 degrees, which is approximately the average for Paducah. The average temperature for the three summer months varies from 75 to 80 degrees and that of the three winter months from 36 to 38 degrees. The average temperature for the hottest month, which is normally July, is about 82 degrees. There is no great difference in temperature conditions in July and August, though it is usually drier in the latter month. Day temperatures of 100 degrees and over are not unknown during the summer months, a temperature of 112 degrees having been recorded at Paducah, but excessively hot spells rarely persist for more than a few

days. Maximum temperatures from 90 to 98 degrees have occurred in all months from March to October inclusive. On the other hand, temperatures from 74 to 84 degrees have been registered during the normally cold months of November to April inclusive, with southerly winds blowing in toward an abnormally well developed cyclonic area to the north.

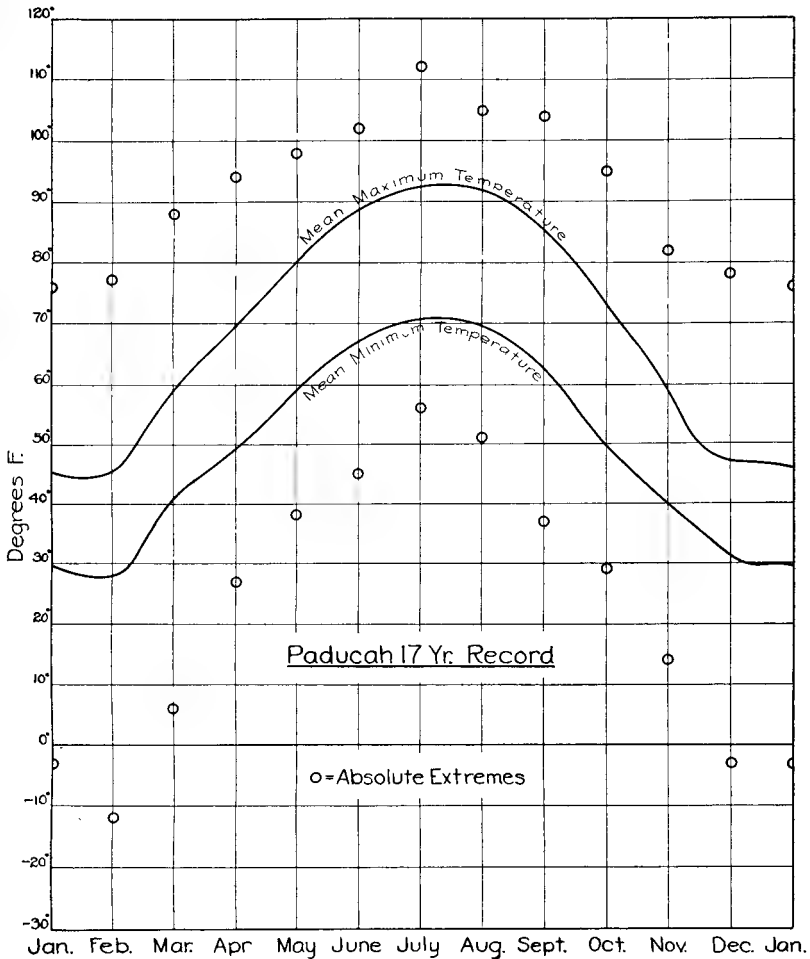


Fig. 6. Temperature record for Paducah.

(Data from Climatological Data, U. S. Weather Bureau, Kentucky Section.)

January and February are the two coldest months, with average temperatures of about 36 degrees. Temperatures of 10 to 20 degrees below zero during December, January and February are known, but their occurrence is relatively rare. The lowest temperature on record occurred in February, 1899, when the thermometer fell to 20 and even to 30 degrees below zero.

Although a considerable departure from normal may occur for a day or a period of days in some one month, the average temperature for a given season or year departs very slightly from the normal seasonal or annual temperature. The location of western Kentucky with reference to the Gulf and the storm tracks tends to produce constancy of wind direction and to reduce the likelihood of frequent and prolonged extremes of temperature. In this respect, conditions are very different from those of more northerly localities such as the vicinity of Chicago, where the relation to storm tracks is such that sudden changes in wind direction are the rule and abrupt changes in temperature are of common occurrence.

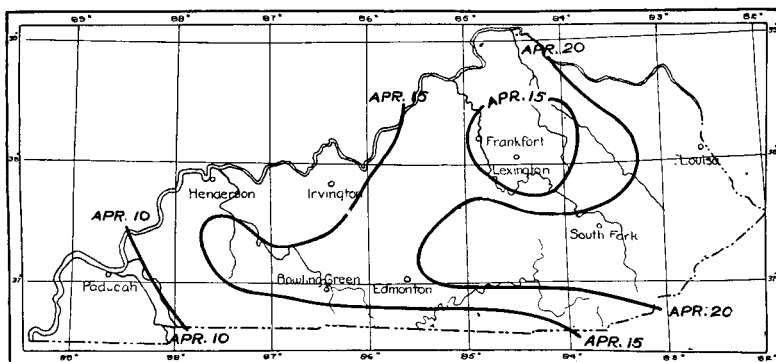


Fig. 7. Average dates of last killing frost in spring. (After Monthly Weather Review, 1917.)

Of all portions of Kentucky, this is the most highly favored as regards the length of frost free season. In 1897, the growing season varied from 216 to 221 days in length, this being the longest frost free period on record for the Purchase. The shortest growing season occurred in 1895, when it fell to 140 days in the vicinity of Blandville. Not all portions suffered equally

in that year, however. The shortest frost free season on record for Paducah is 180 days, in 1907. The range of probability is from 183 to 206 days with a practically sure frost free season of 170 days, from April 22 to October 9, in the northeastern

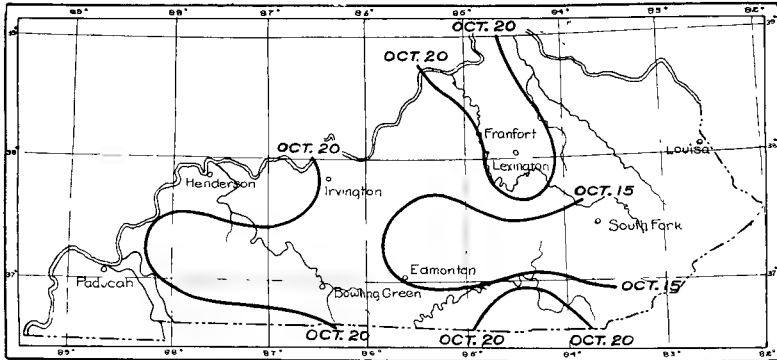


Fig. 8. Average dates of last killing frost in fall. (After Monthly Weather Review, 1917.)

portion. The length of the season increases to the southwest, reaching a maximum, normally of 180 days or more, in the cotton growing sections (4) of Fulton County. The last killing frosts of record in spring vary from March 25 (1912) to May 14 (1895) and the earliest in the fall from September 30 (1899) to November 8 (1900). (5)

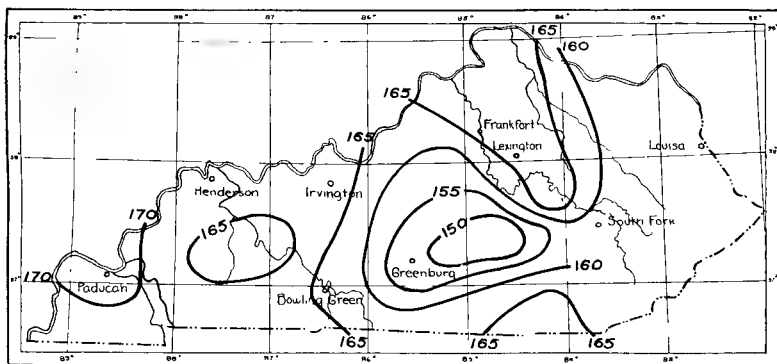


Fig. 9. Number of days in growing season, 4 years out of 5. (After Monthly Weather Review, 1917.)

Unseasonable frosts are especially frequent and do the most damage in the hilly regions, particularly along the Tennessee

River, where the topography is most broken. In general, however, the frost free season is of sufficient length and the temperatures which exist during the warmer portion of the year are sufficiently high to allow the cultivation of a great variety of crops. Corn is grown successfully in all portions of the Purchase; tobacco is likewise a common crop in every county, and in Fulton County, in the extreme southwest, the frost free season is long enough to allow the maturing of cotton.

HUMIDITY AND PRECIPITATION (1) AND (6)

During the winter, the relative humidity is usually somewhat higher than in the summer, but there is so little seasonal variation that it is negligible, the periodic variations within a given month exceeding the seasonal change.

During the year, the average number of days with .01 inches or more of precipitation ranges from 92 to 101, varying with the station. March and May normally have the greatest number of rainy days. The spring months lead in the number of days with appreciable precipitation, followed by winter and summer with the same number of rainy days each. The fall months normally have the most clear days.

The percentage of actual sunshine in terms of hours of daylight for the entire year is approximately 60, with a pronounced summer maximum, the three summer months having an average of nearly 80%, which falls to less than 50% during December, January and February. This distribution of sunshine, with the maximum during the late growing and fruiting season, accompanied as it is by high temperatures and a normally sufficient rainfall, provide a favorable climatic combination for varied crop production.

The precipitation is largely in the form of rain. The mean annual snowfall at Blandville amounts only to 11.9 inches, and at Paducah, to 12.5 inches. This is a small snowfall. Corrected to terms of rain, this is only a trifle over an inch. Occasional heavy snows occur, as in December, 1917, when a blanket of snow covered the ground to a depth of 16 inches at Paducah. Most of the snow falls during December, January and February, these three months having mean snowfalls of 3.3, 3.8, and 3.7 inches respectively at Paducah.

Even during the winter, the precipitation is largely in the form of rain. In states farther to the north, as in southern Michigan, the mean annual snowfall expressed in inches exceeds the mean annual rainfall in inches, but in the Purchase, the inches of snowfall are less than the inches of rain during the months in which the snow falls. Moreover, the snow does not remain as a blanket covering the ground, as normally the daily temperatures rise above freezing, even in midwinter. Under these conditions, the bare and often unfrozen ground suffers greatly from slope wash.

Sleet and hailstorms are not uncommon. The sleet, or more properly icestorms, occur in late spring or early fall and even in winter. Property damage results from the weighting down and breaking of wires and the branches of fruit trees. Hail occurs in the summer in connection with thunderstorms and may cause much damage to crops, particularly to tobacco and corn. The likelihood of such storms is not great, hail damage being below the average for the United States.

The normal rainfall is approximately 45 inches. There is considerable variation in the mean annual rainfall reported by different stations, Lynnville reporting 53.04 inches, Mayfield 39.62 inches, Paducah 43.99 inches and Blandville 48.21 inches. As the average for all the stations is 46.21 inches, and as the records for Paducah and Blandville are available for a much longer period than for the other stations and therefore more nearly represent the average condition as to precipitation, it is probable that the average for the entire area is not far from 45 inches. The smallest amount of precipitation for any one year at the Paducah station was 27.69 inches in 1887 and the maximum amount 57.43 inches in 1883. Blandville, for the same two years, reported 39.37 inches in 1887 and 58.12 inches in 1883, but at Blandville, the maximum occurred in 1882, when 73.39 inches of rain fell.

The rainfall is usually well distributed throughout the year, though March shows the greatest amount of precipitation and October the least for any one month. The three spring months are closely followed by the three winter months as to amount, the fall months having the smallest rainfall. This distribution of rainfall, with its spring and winter maximum and autumn

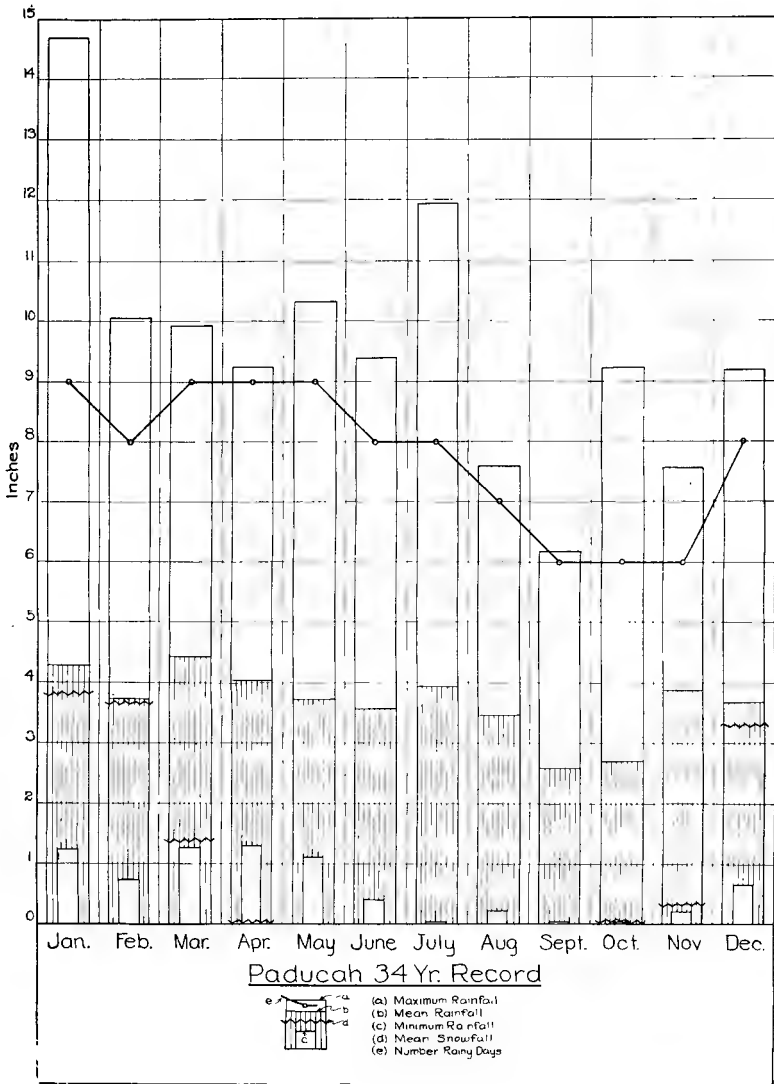


Fig. 10. Precipitation record for Paducah.
Data from Climatological Data, U. S. Weather Bureau, Kentucky Section.

minimum, is sometimes referred to as the Southern Appalachian and Tennessee type of precipitation. (3) These heavy winter and spring rains convert the clay roads into seas of mud and restrict automobile travel on the gravel highways, since bridges

are commonly lacking over the small branches. Soil erosion is also greatly increased by this distribution of rainfall as the ground is then bare of vegetation and generally unfrozen at the time of maximum precipitation and run off.

The normal rainfall is ample for growing the staples of the area, but occasionally there exists a marked seasonal rather than annual deficiency or excess, either of which may be detrimental, though the former is more so than the latter. During the summer of 1921, for example, the spring was excessively rainy, whereas later, during July, crops suffered for lack of moisture. Droughts, as they occur in more westerly states, are unknown, and where the land is in really good tilth, crops usually weather even the driest spells in good condition. As much of the land is not in good tilth, however, these droughty spells, which occur on an average of three times in each decade, do much damage, though total crop failure is usually prevented by timely showers.

The rainfall runs off rapidly into the streams. The branches, which are normally dry during the summer months, become torrents within an hour after rain begins to fall. Even the roads serve as stream tributaries to carry off the surplus water which falls during a summer shower. After such a shower, the branches go down as rapidly as they rise, but in the winter and early spring, they may be flooded for longer periods. The typical condition of a branch during the summer months is shown in Plates XXXIII and LVII. The rapidity of the run off is indicated by Plate XVII, which shows one of the larger creeks practically dry twenty-four hours after a heavy summer shower. Fluctuations in creek volumes during the summer are rapid because the drainage systems are short and well developed. Thunderstorm rainfall is not absorbed by the clayey soil, which is for the most part bare of forest cover and devoted to the growing of crops which involve clean cultivation, but rapidly finds its way into the drainage channels.

The late winter and early spring run off, with the ground saturated from previous rains or frozen, produces floods in the Ohio, Tennessee and Mississippi rivers. At Paducah, the Ohio River has passed the flood stage of 43 feet, fourteen times since 1867. The greatest of these floods occurred in 1913, when the government gauge on Broadway registered 54.2 feet. This gauge,

a brass strip embedded in the cement of the sidewalk on the north side of Broadway, registers the rise of the river in feet. The flood possibilities in the Purchase, which is bounded by three great rivers, the Tennessee, the Ohio and the Mississippi, all subject to floods originating possibly in far distant waters, are complex. In addition, the smaller creeks, whose drainage basins lie largely within the area, are also subject to floods.

Flood damage along the Tennessee River is not extensive, as the overflowed area is neither large nor densely settled. Along the Ohio and Mississippi rivers, the present day flood plains are much more extensive and the overflowed area is large. The bottoms which are not protected by levee are, however, still largely uncleared and uncultivated so that, even when flooded, the property damage is not great. The Mississippi bottoms below Hickman, which are protected by levee, have not been overflowed since the construction of the levee.

Paducah is built in large part on the second bottoms of the Ohio River which are not overflowed, though the lower portions of the city, on the present day flood plain, are subject to flood. During the exceptionally high water stage of 1913, it was necessary to abandon nearly 100 houses or about 2% of the homes in the city. Wickliffe and Hickman, on the Mississippi River, are built on the bluffs overlooking the river, only small portions of these towns being affected by floods. (See Plate LXIII.) Columbus alone of all the river towns has suffered severely by the ravages of the Mississippi River. As it is built largely on the river flats, the town site is rapidly disappearing under the attack of the stream.

Because of the small amount of cultivated land subject to overflow and because the river towns are only in small part located on land subject to overflow, property damage from floods in the Tennessee, Ohio and Mississippi rivers is not great by comparison with losses in other areas both up and down stream.

Approximately 20% of the entire Purchase is embraced in creek bottoms, much of which is subject to overflow. Considerable work has been done (See pp. 89-91) to make these lands more available for use and more work is contemplated. The aggregate of property damage by flood is probably greater on the creek bottoms than on the bottoms of the larger streams,

though losses which do occur are not so striking, the damage being largely in the form of decreased crop yields.

The climate of the Purchase is a very desirable type of the humid continental. Temperatures are seldom extreme and such extremes are usually of short duration. The predominantly southerly winds, seldom violent, normally bring an abundance of moisture from the Gulf in all months of the year. The drier weather during the fruiting season, associated as it is with sunshiny weather and high temperatures, assures favorable climatic conditions for crops. Due to cyclonic control, the climatic factors are necessarily variable, but the variations are more infrequent and less pronounced than in most adjacent areas. Everything considered, the Purchase has a climate well suited to the growing of a large variety of staple crops.

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CHAPTER IV.

NATURAL RESOURCES

SOILS

The soils of this section of the state differ from those of the sections farther to the east in their relation to the underlying rock formations. Whereas most of the soils east of the Tennessee have been formed in place by the decomposition and disintegration of the rocks which lie beneath the soil (18), in the Purchase, the soils have been transported to their present position by wind or water (1) with the exception of the soils of the narrow strip immediately west of the Tennessee River, where they are the result of the decomposition of the underlying Mississippian rocks. There the hills show a large accumulation of relatively insoluble chert embedded in a matrix of residual soil. The soils of the upland are also generally deeper than elsewhere in Kentucky and are characterized by an absence of the rock fragments so common in other portions of the state. Instead, beds of gravel or sand lie beneath the soil, usually at depths sufficiently great not to interfere with tillage.

UPLAND SOILS*

The soil type characteristic of the smooth upland away from the hilly stream margins is a yellow silt loam (10). In Graves County, it is estimated to comprise 36.13% of the area of the county. (10) The relation of this type of soil to the drainage pattern and the yellow brown silt loam (10) is shown in Fig. 11. In lesser percentage, this same type of soil occurs in northern Calloway County, comprising approximately 15% of the land. In still lesser amount, it is present in central Ballard, western McCracken and southwestern Marshall counties. Its extent represents the limits of former prairie or grass covered portions of the Purchase.

Where well drained, the surface soil of the old prairies is a yellow silt loam, but in the flatter, more poorly drained portions, it is gray to whitish in color and "crawfishy" (contains

*The upland soils are named according to the system of nomenclature used by the Ky. Agr. Exp. Station.

Numbers in parenthesis refer to the bibliography at the end of the chapter.

crawfish holes) in character with red and yellow ferruginous concretions. The subsoils likewise vary according to drainage. Where well drained, there is a change at a depth of from 15 to 18 inches from a light yellowish loam mottled with grayish streaks to a grayish or whitish color. (10)

The yellow brown silt loam (10) is the most extensive soil type in the Purchase, comprising the soils of the originally timbered hilly areas and rolling ridge lands except in limited areas along the Tennessee and Mississippi rivers. In Graves County, it embraces 43.39% of the entire county (10) and similarly large percentages of Calloway, Marshall, McCracken and Ballard counties. To a lesser extent, it appears in Hickman, Carlisle, and Fulton counties in their eastern portions. The surface soil is a yellowish brown silt loam from 6 to 12 inches deep, though the color may become more grayish on the ridges where drainage is not so good. These soils are mellow and open, but the subsoils are compact and show the same gray streaks and iron stains as the subsoils of the yellow silt loams.

The two preceding upland soil types are more than 55% silt, with from 15% to 25% of clay. Hence they are classed as silt loams. Differences in color and physical condition of the two types are not due to differences in origin, as both are probably of "glacial and loessial" origin. (10) Existing differences are the result of differences in drainage conditions and the amount of leaching. Where the natural drainage is poor, the soils have a tendency to be chalky in color due to excessive leaching. They are there also hard, compact and poorly aerated, the extreme of this condition occurring in the more poorly drained portions of the yellow silt loam area, where the subsoil is often so hard and compact that it serves as a "hardpan" (10), from which crops suffer during both wet and dry weather. Where natural drainage is good, the soils are mellow and open as in the typical brown silt loams. Both soil types are utilized for growing the same crops, corn and tobacco, but both land values and yields are higher in the areas of better natural drainage provided soil wash is not serious.

In Marshall County, to the southeast of Benton, and in Calloway County, southeast of Murray, there are two sections of level uplands, the Flatwoods, with areas of nine and fifteen

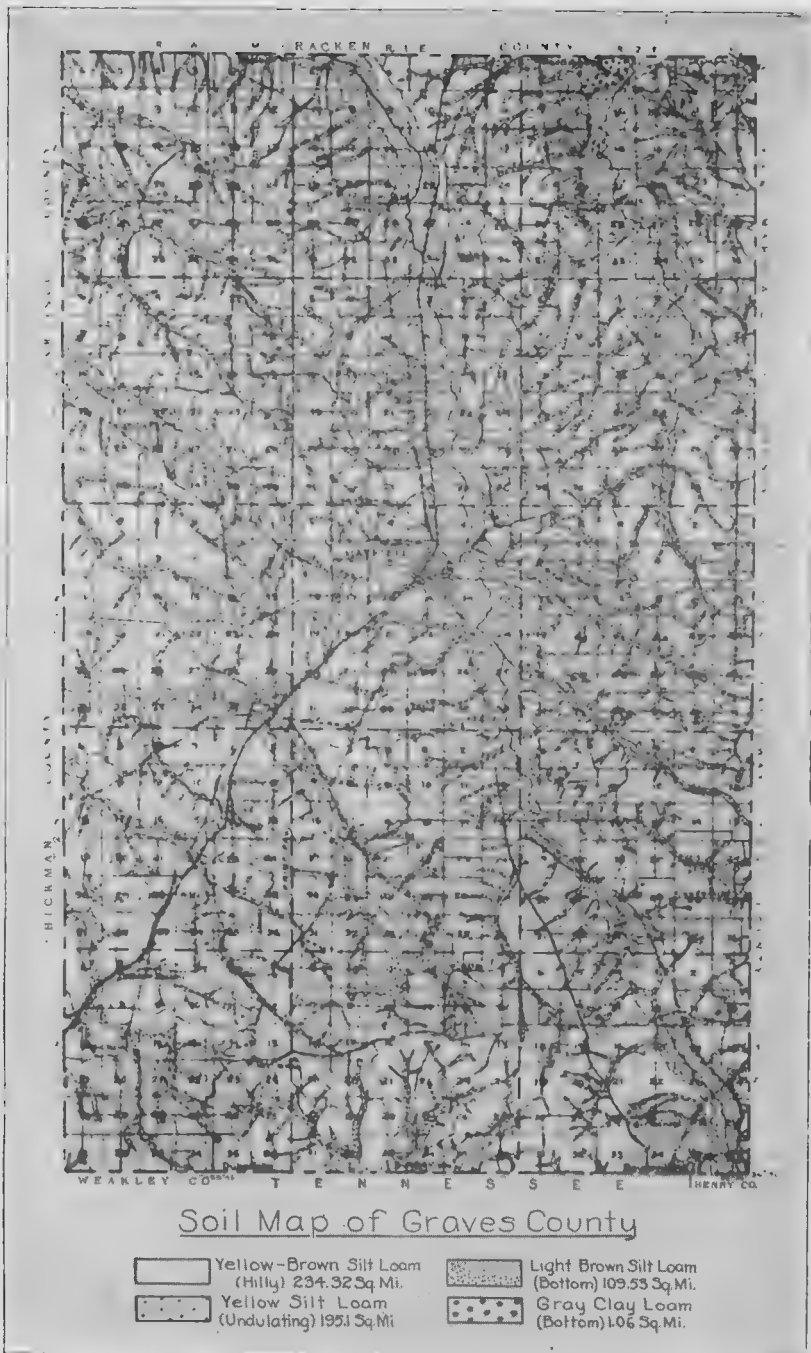


Fig. 11. Soil map of Graves County. (After Bull. 194, Ky. Agr. Ex. Station, 1915.)

square miles respectively. Where the surface is low or "glady" (11a), so that drainage is poor, the soil is stiff, whitish and "crawfishy." The soil is a poor type of the yellow silt loam. In those portions where drainage is good, the soil is a yellow brown loam, similar in color and appearance to the soils of the hilly timbered upland. As elsewhere, the poorly drained, chalky colored soils are less valuable and produce poorer yields than do the better drained soils. These soils as well as those of the prairie region and the timbered hilly upland are deficient in lime and phosphorus. (16)

The loess area extends from the Mississippi River bluffs eastward a distance of eight to fifteen miles, the eastern margin grading imperceptibly into the yellow brown silt loams of the hilly uplands. In general, it constitutes the uplands of the west



Plate VI. The loess area west of Clinton, Hickman County. Relatively steep slopes are cultivated without excessive soil wash in the loess covered areas.

half of Fulton, Hickman and Carlisle counties and the western third of Ballard County. This loess covered area includes the "Cane Hills" as well as the gently rolling lands to the east. The immediate surface is usually a yellow brown loam which is underlain by from ten to twelve feet of the ash gray loess. These soils are of high fertility, the best of the upland soil types on account of their almost ideal structural characteristics and their high lime content.

An areally unimportant as well as agriculturally nonsignificant type of upland soil occurs over the cherty outcrop of the Mississippian limestone west of the Tennessee River. This thin cherty soil is of practically no agricultural value and supports but a poor type of tree growth, as in addition to being thin, it is commonly sandy.

Most of the upland soils wash badly under cultivation, this being particularly true for the yellow brown silt loams in the hilly areas. It is less true in the interstream areas, though even there the run-off has exacted a heavy toll from the farms. In the loess area, however, comparatively steep slopes can be cultivated without serious danger of erosion as the loess, because of its porous, open texture, absorbs the rainfall effectively and so stands, even in steep slopes, without washing.



Plate VII. Soil erosion on a steep slope in southeastern Graves County.
Yellow brown silt loam soils.

It is difficult to estimate accurately the amount of land which has been ruined by soil erosion, but the total for the Purchase is easily in excess of 50,000 acres.* In driving through the country, in certain sections, one is seldom out of sight of an eroded field. The accompanying illustrations were picked at random from widely separated areas. The significance of this

*Personal estimate.

enormous loss of cultivable acreage during the short period, in general much less than a century, which the land has been occupied, is not appreciated by the users of the land and the pressing importance of the question is not always fully grasped by the leaders of movements for improving farm conditions, the tendency being to lay the emphasis on marketing problems rather than to endeavor to lay the foundation for permanent use of an undiminished land area.



Plate VIII. Soil erosion on a moderate slope in Marshall County. The Cloumbia loam is here about six feet thick and rests on the Lafayette gravel.

Soil erosion has been aggravated by a variety of causes, one of the most important of which has been the deforestation of slopes too steep for successful cultivation. In eastern Marshall and Calloway counties, from 60% to 75% of the land is fit only for forest growth, or possibly for grazing, the bottoms being the only portions capable of permanent utilization in the production of crops. Many of these steep slopes have been cleared with results disastrous to slope and bottom alike.

Soil wash, however, occurs not only on the steeper slopes but in the gently undulating areas as well. In an area where the bulk of the precipitation comes as rain and where the ground is frozen for short periods only and never to great depths, run-off is effective in causing excessive erosion during most of the year.

The run-off is also very rapid as the drainage basins are small and there are no lakes and few swamps to regulate the stream flow, the forest cover also having been largely removed. In addition, the staple crops, corn and tobacco, involve clean cultivation and this, together with the common farm practice of growing these crops until they no longer pay, and then allowing the field to remain idle without a cover crop, leaves the soil bare, deficient in humus, hard and compact, and extremely susceptible to wash. One has only to witness one of the heavy summer showers and observe the muddy torrents along the roadside to realize the ultimate effect of allowing present conditions to continue.



Plate IX. Soil erosion on a gentle slope in southwestern Graves County. Persimmon bushes are taking the field.

The obvious remedies are restoration of the forest cover on the steeper slopes and the introduction of a more intelligent use of the land under the plow. This would involve some consideration of the slope in plowing, the establishment of permanent pastures on the steeper slopes not in forest, the growth of cover crops and a system of crop rotation designed to maintain permanent soil fertility, to increase the humus content, and to add to the absorptive power of the soil.

BOTTOM SOILS

Creek bottoms comprise a rather high percentage of the land surface, in Graves County 20.28% of the entire county (10)

and at least as large a percentage in the other counties. Excellent crops are grown on many of them as accompanying illustrations testify. The normal soil is a light brown silt loam, but

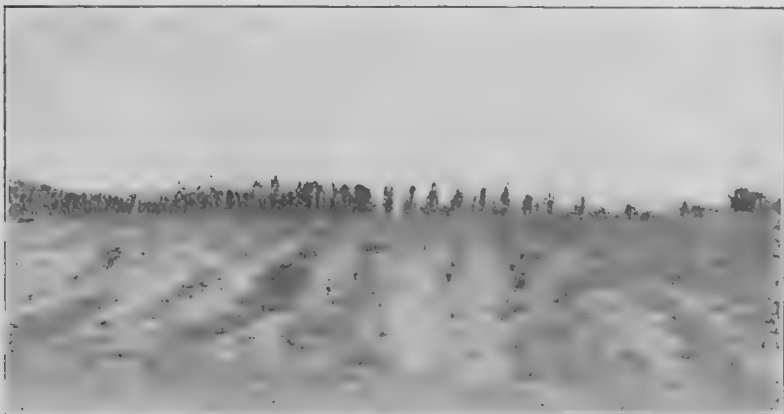


Plate X. Incipient gullies in an idle field in northeastern Graves County. The gullies have developed along the furrows which run parallel to the slope.

there may be considerable sand present, derived from the adjoining uplands. In the more poorly drained bottoms, the soils are

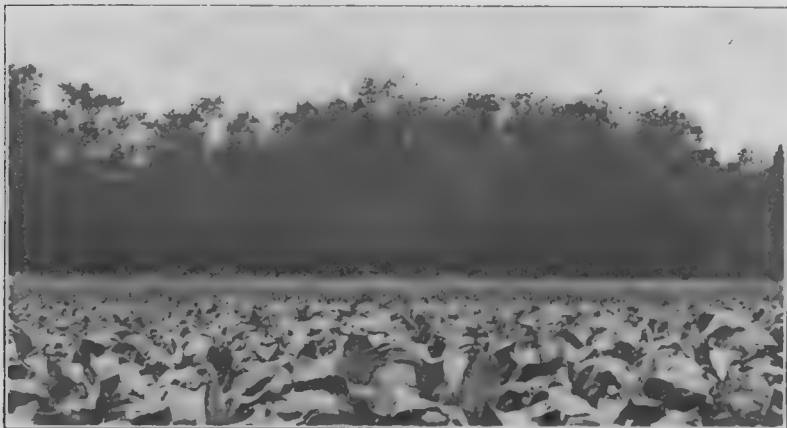


Plate XI. Excellent crops are raised on the creek bottoms. Cotton and tobacco on a bottom. West Fork of Clark's River, Marshall County.

whitish and crawfishy. The subsoils are yellowish to grayish in color, changing to a white, compact, iron stained subsoil with

iron concretions in the wetter portions. (10) These creek bottoms are rather flat, rising on the margins of the larger creek valleys to what somewhat resembles a second bottom. These more elevated portions of the creek bottoms are probably in large part the result of slope wash.



Plate XII. "Second bottoms" of Mayfield Creek in northern Graves County. The land gradually rises from the first bottoms at the right to the upland at the extreme left.

The second bottoms of the Ohio, Tennessee and Clark's River represent flood plains formed when these rivers flowed at a higher level than at present. Nowhere do they reach a great width, the maximum being about six miles in Ballard County, on the Ohio. The total area is possibly 160 square miles. These terraces are flat topped and poorly drained and the soils are stiff, cold and inclined to be crawfishy. (11b) On account of their greater age, the soils are more leached than the soils of the first bottoms. In places where natural drainage is good, the soils are light and loamy and similar in color and character to the soils of the oak and hickory uplands.

The soils of the first bottoms of the Ohio and Mississippi rivers are fertile, but change in character with increasing distance from the river. Along the banks of the rivers, the land is usually higher than in the interior. These front lands are sandy, being formed of deposits made by the river at high water

stages. The sand is mixed with finer material and is well drained so that it dries out rather early and this, together with its fertility, makes it highly desirable.



Plate XIII. Cotton in the foreground and corn in the background. On Sassafras Ridge on the Mississippi bottoms of southwestern Fulton County. This shows the character of the crops raised on the sandy portions of the bottoms.

In addition to these higher, sandy front lands, other sandy ridges frequently occur, probably older natural levees. The most prominent and largest of these is Sassafras Ridge, west of Hickman in Fulton County. This ridge has a length of about three miles and a width varying from one-quarter to one-half a mile. The accompanying illustration, Plate XIII, shows the character of the crops raised on such ridges.

The sandy ridges on the Ohio bottoms are bordered on either side by a series of small lakes and sloughs. The accompanying illustration, Plate XIV, shows one of these sloughs. Some of the sandy ridges on the Ohio bottoms are wide and high enough to be inhabited, though the soil is not specially enduring or fertile. These sandy portions of the bottoms dry out early and suffer more severely from drought than do the soils of the adjacent upland.

The backlands have a deep, rich loam soil, black because of the organic matter present. There seems to be an entire absence of the buckshot soils which occur on the Mississippi bot-

toms farther to the south. (11c) Buckshot soils are so named because of the manner in which they crumble on drying. These bottom soils of the backlands are of extraordinary fertility, high in plant foods, probably constituting the most fertile soils of the Purchase. The lower portions of the bottoms of the Bayou de Chien and Obion Creek are formed largely of Mississippi alluvium and therefore resemble the larger bottoms in the character

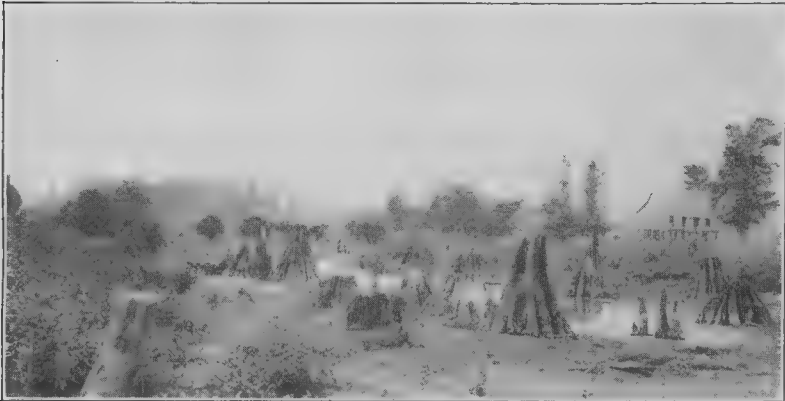


Plate XIV. Slough and house on a sandy ridge on the Ohio bottoms west of Barlow, Ballard County. Cypress stumps in foreground.

of their soil. These larger bottoms, subjected as they are to annual overflow, are available for agricultural use only in the higher, sandier portions and in those places where levees prevent overflow.

MINERAL RESOURCES

CLAYS

Of the mineral resources of the Purchase, the clays are of the most commercial significance, both at present and as regards future possibilities. The deposits are extensive, clay of commercial quality being found in all the counties (4), though the greatest development of the resource has occurred in Graves County in a belt paralleling the line of the Illinois Central Railroad, where the deposits are thick and covered with a small amount of overburden. Distance from a railroad is a limiting factor in the development of such deposits, as they cannot be

worked profitably if it is necessary to haul the clay far over poor, hilly roads.

The pottery clays occur as lenses in the Ripley and La Grange formations, most of the deposits now exploited being in the latter formation. These clays have been derived from the decomposition of Paleozoic rocks to the east, the pure white, siliceous clays probably representing the decomposed chert of the Mississippian. (8a) Many of the clays are colored by organic matter and grade into lignitic clays or lignite, due to the shallow character of the basin in which the original deposition occurred.

Both saggar (refractory) and ball (unrefractory) clays occur in the lenses in the La Grange formation, the saggar clay being more abundant in the pits which have been opened. In the pit at Clay Switch, near Pryorsburg, several layers of different character occur, the upper layer being highly lignitic. (See Plate XV.) Deposits are so widely scattered and so numerous that it is impracticable to list all the known occurrences. The supply is practically inexhaustible.

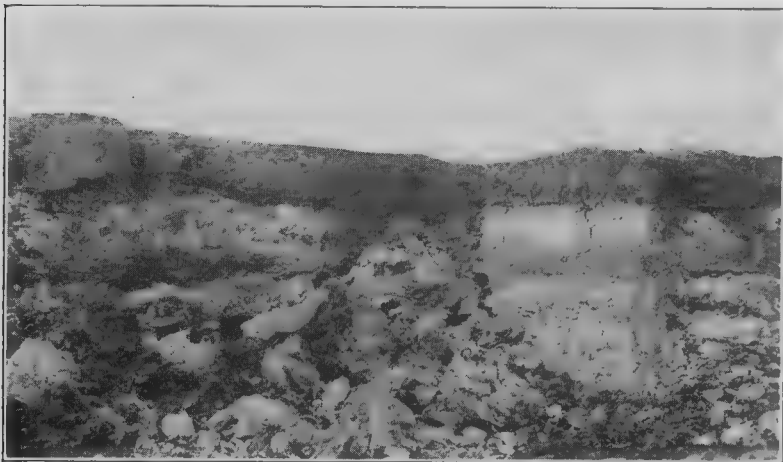


Plate XV. Face of clay at Pryorsburg pit showing the different layers of clay and the capping layer of lignite.

In addition to the deposits of saggar and ball clay, ocherous clays occur at numerous places. These clays are yellow, but on burning, become bright red in color. Such deposits are

known in Marshall, Ballard, McCracken and Calloway counties. These ochereous clays might have use in paints. When burned, they make a good red face brick. (11d)

The clays of the Columbia formation afford a source of material for ordinary brick, and when burned, often produce a very satisfactory face brick, red in color. Such clay is obtained by removing the surface soil to a depth of about a foot and utilizing the underlying material.

LIGNITES

Lignite occurs in both the Cretaceous and Tertiary formations. It has occasionally been mistakenly considered to be valuable as a fuel. These Kentucky lignites occur in connection with the clay lenses of the Ripley and La Grange formations and may locally attain a thickness of as much as fifteen feet. The occurrences are widely distributed, such deposits being reported from Ballard, Graves and Calloway counties. (11e) In those examined, the lignite is fine, compact and homogeneous, with a large admixture of the clay with which the deposit is associated. It will burn when dry, but the ash content is high and only a small amount of heat is afforded. As a fuel, it will never have any economic importance, though certain beds may supply the needs of the farm where the deposit occurs. When the clay content is high, a very light, porous fire brick can be made by burning the clay. At present, this process has not passed the experimental stage.

IRON ORES

Deposits from which iron may be obtained are of historic interest, but of no present importance as a source of iron. Wherever Lafayette gravels overlie an impervious clay, the percolating ground water with iron in solution may deposit the iron above the clay in the form of plates and concretionary masses. This has been the origin of the ores of the Purchase. Such deposits occur in the gravels overlying the Porter's Creek clays and the clays of the La Grange formation. None of these deposits is worked at present, but at an early date iron was obtained from these so-called "Iron Banks." Perhaps the best known of these early workings is the one known locally as "The

Coalings," in southeastern Calloway County. Two banks were worked. At one, near Shannon Creek, a furnace was in operation for so many years that the surrounding country was denuded of timber to supply the charcoal for the reduction of the ore, hence the name of "Coalings." (11f)

GRAVEL

The Lafayette gravel furnishes excellent road building material in almost limitless quantity. The gravels of this formation generally lie close to the surface, and except in the loess covered areas, such shallow deposits are well distributed throughout the Purchase. In the hilly upland, the gravel often lies only a few inches below the surface. (See Plates III and XVI.) every hilltop being a potential gravel pit. On the more level and undulating uplands, the deposits are more deeply covered, but in such cases, many of the branches are floored with gravel which has been reached by the down cutting of the stream or washed down from the higher uplands. These creek deposits are equally suitable for road construction.



Plate XVI. In the hills, the gravel lies close to the surface. To the right of the road, the soil is only a few inches deep over the Paducah gravel. Scene in southwestern Graves County.

The gravels are highly ferruginous, so that they "bond" readily, forming a hard, compact roadbed. In the eastern coun-

ties, the gravels are dark brown or reddish brown in color, practically every pebble being iron stained. To the west, except locally, this is not so marked, though everywhere the iron content is high. There are few sections of the country with as



Plate XVII. Creek bed gravels near Pryorsburg. Picture taken the day after a heavy summer shower, showing the rapidity of run off.

abundant and satisfactory a supply of material available for road construction as these Purchase counties possess in the gravels of the Lafayette formation, frequently referred to as "Paducah" gravels.

SAND

Sand, varying from white to yellow and red in color, occurs in the Ripley, La Grange, and Lafayette formations, the beds in most cases being both thick and extensive. Many of these deposits, where reasonably free from iron oxide, might be used in making ordinary glass. (14) Their principal use at present, and probably for some time to come, will be in the making of mortar and concrete.

POLISHING POWDERS

Some of the siliceous earths or arenaceous clays have possibilities as polishing powders. (11g) Such deposits are known in various parts of Graves, Calloway and Marshall counties.

These deposits consist of fine, indurated sands, silty clays or siliceous earths originating from the decomposed chert of the Mississippian formation. (8a) None of these deposits is being exploited commercially so far as is known.

WATER RESOURCES

All boundaries of the Purchase, except the southern, are large rivers, navigable by boats of considerable size at all seasons of the year. These rivers, prior to the advent of the railroads, played an important part in the location of towns and the scheme of transportation. Today, in lesser degree, the Ohio and Tennessee function to supplement other methods of transportation, though the use of the Tennessee is somewhat restricted by the hilly character and limited resources of the area through which it flows.



Plate XVIII. A river packet leaving Paducah for a trip up the Cumberland River.

Extreme variability of volume prevents the use of the creeks as sources of power. In addition to the great variability which characterizes the stream flow, the fall is slight and the waters are muddy.

UNDERGROUND WATER*

The character of the underground water varies with the formation in which it occurs. Water obtained from the sandy formations such as the Ripley and the La Grange, and often from the Lafayette as well, is practically free from mineral ingredients as these formations contain little that is soluble in the water which percolates through them. (8b) Water obtained from the lignitic clay lenses of either the Ripley or the La Grange always contains considerable mineral matter, but in many cases, is usable for most purposes. When obtained from the Porter's Creek clays, however, the water is hard and astringent due to the presence of sulphate of iron and alumina. In addition to these substances, sulphuretted hydrogen is frequently present. (8c)

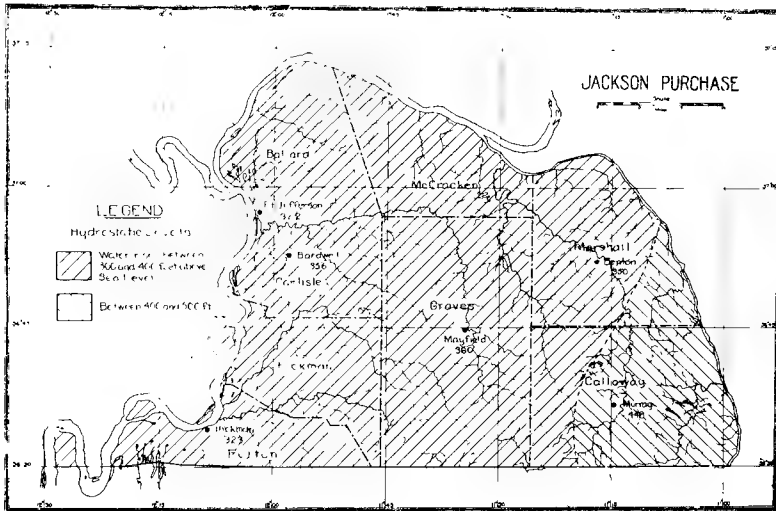


Fig. 12. Hydrostatic levels. (After Water Supply and Irrigation Paper No. 164, 1906.)

In the loess area, water from shallow wells is hard because of the calcium carbonate dissolved from the loess. Water from wells in the alluvium usually contains iron carbonate or sulphate, and sulphuretted hydrogen is sometimes present. (8d)

*This section on underground water is based in large part upon work done by L. C. Glenn.

In various places, the mineral content of the water is sufficiently high to allow it to be characterized as mineral water. These waters are frequently chalybeate and may contain salts of sodium, potassium, and lithium in addition to the minerals commonly present. (8e) Locally, these waters are reputed to be of value in the treatment of certain diseases. Such springs are known near Hickman, Blandville, Stubblefield, Water Valley and at Sedalia and various other places. Although these springs have some local reputation, and at Sedalia and possibly at other points, have been commercially exploited to a limited degree, their use is still local and any considerable future expansion of their utilization is doubtful.

The softer waters are perfectly satisfactory for domestic use and for utilization in steam boilers. The hard waters can be used if treated to remove the mineral constituents. In most places, by going to a depth of 150 to 300 feet, good water may be obtained from one of the sands. The height to which the ground water rises is indicated by the accompanying diagram, Fig. 12. By comparison with the topographic map, Fig. 4, it will be seen that the water from these sands will rise nearly to the surface, or in some cases flow without pumping. Such artesian wells are the source of the water supply for most of the larger towns.

NATIVE VEGETATION

The determination of the former distribution of woodlands and prairies is based largely upon the testimony of the older inhabitants and such descriptions of the earlier conditions as are available.* When white men first came into the country, the prairies were much more extensive and the forested areas much more restricted than at a later date. In general, the hills and bottoms were forested and the more level interstream areas were covered with grass.

The untimbered sections comprised those portions co-extensive with the yellow silt loam soils and the Flatwoods of Marshall and Calloway counties. Roughly this embraces a large portion of Graves County and a small section of southwestern Marshall

*The best of these is the report on the Purchase Region by R. N. Loughridge. See bibliography at the end of the chapter.

County. Even in these localities, trees were not entirely absent as the creek bottoms and the hilly areas adjacent to them had a forest cover.

Evidence that the treeless character of the more level country was brought about by fire is abundant locally as it is in other parts of Kentucky where similar grassy tracts existed at an early day. The forests were in many cases scarred by fire; no young trees were springing up, as all seedlings were killed by the annual fires. Thus the prairies gradually grew in extent as the older trees died and young trees failed to take their place. It is the almost unanimous opinion of early observers, competent to judge, that the treeless character of the prairies was due to the firing of the grass by the Indians.

On account of the lack of trees, these prairies early received the name of "Barrens," as they were deemed infertile. Previous experience with untimbered land had unfitted the early settlers to appreciate the fact that such a treeless condition did not necessarily imply lack of fertility. Treeless tracts in the east were lacking in desirability, so the early settlers judged these western Kentucky lands by standards which were not applicable to local conditions.

Loughridge, writing in 1888, states that in 1854: "A person could hardly get a switch between Mayfield and Obion Creek" and that "Prairie grass grew as high as the head of a man on horseback and devil's shoestrings and Indian red root plant were abundant." This condition persisted as late as 1863. According to statements made to the writer by early settlers in the Flatwoods south of Murray, similar conditions existed there at an early date. With the removal from the country of the Indians and the lessening of fires with increasing cultivation, the forests extended in area, so that much of the country which was originally prairie, had to be cleared before being put under the plow. Even today, however, in spite of the rapid spread of the timber, the character of the forest makes it possible to delimit with considerable accuracy the extent of the original prairie area.

In the Barrens proper, the trees which first gained a foothold were probably black jack oaks. These were followed by the red oaks and occasional post oaks. Writing in 1888, Lough-

ridge notes: "Since the opening up of the country to civilization, a growth of red oak and black jack oak has sprung up over the entire region—the trees have a uniform height of about twenty feet and there is a noticeable absence of other varieties or larger growths." A similar forest association characterizes the section today with the addition of a few post oaks.

In the originally untimbered Flatwoods areas of Marshall and Calloway counties, the post oak and the black oak are the most numerous representatives of the oaks, though occasional white and red oaks occur as well as some dogwood, locust and sassafras. Hickory grows in the better portions, where the soil is well drained and loamy; in the more poorly drained portions or the "glades," the post oak is the dominant tree.

On the hilly upland areas away from the creek bottoms, oak and hickory constitute the bulk of the growth. On these yellow brown loams, the oaks are represented by the red, black, Spanish and post oak. On the drier flint hills along the Tennessee River, the black jack oak is the principal tree. To the west

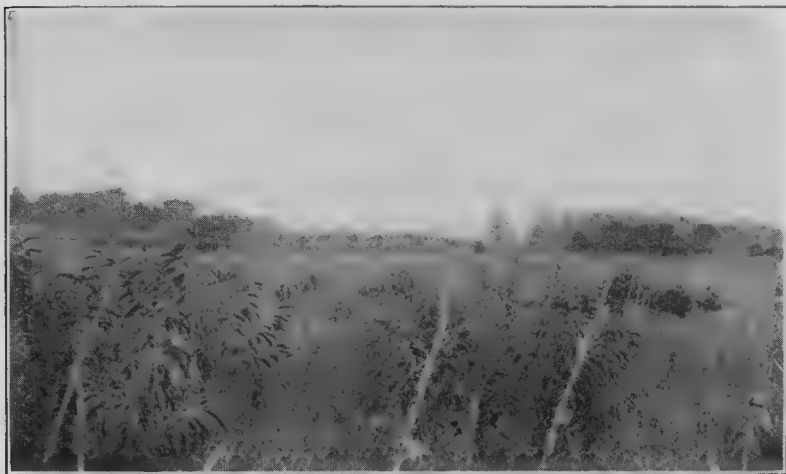


Plate XIX. Persimmon sprouting in a last year's corn field. In the hills east of Mayfield, Graves County.

of this chert area, hickories are associated with the oaks on the yellow brown loams of the hilly upland. There is also a scattering growth of sweet gum, tulip, elm, maple and chestnut, with some wild pecan, chiefly on the bottom land.

When cleared fields remain out of use, the persimmon rapidly takes possession. The seeds, which are spread widely by hogs, opossums and other animals, remain dormant for long periods awaiting conditions favorable for germination. A farmer expressed the great difficulty of ridding the fields of these trees by the statement that "the only way to get rid of the persimmon was to die." These trees sprout in unused fields in all parts of the upland, but are particularly troublesome in the hilly areas of the yellow brown loam soils.

One of the heaviest and most varied of the original upland forest growths was found on the Cane Hills or the high hills bordering the Mississippi River bottoms. These hills constitute the northern extension of a similar area in Louisiana, Mississippi and Tennessee characterized by a similar forest with a heavy undergrowth of cane. (11h) The surface is underlain at no great distance by the calcareous silt of the loess, which allows the characteristic vegetation of the bottoms to extend to the upland and grow as luxuriantly as at the lower levels. There were a great variety of oaks—white, chestnut white, black and Spanish, as well as hickory, walnut, tulip or "poplar," linn or basswood, elm, beech, pawpaw, sweet and black gum, large sassafras and a dense undergrowth of cane. Nowhere else on the upland was the timber so varied, the stand so dense or the trees so large.

The creek bottoms were heavily timbered and still retain a considerable portion of the original forest cover. The bottoms of Mayfield Creek were covered with white oak, various water oaks, hickory, black and sweet gum, tulip, some walnut, redbud, catalpa and scattering pecans. In the wetter portions of the bottoms, cypress was found. The bottoms of Clark's River, Obion Creek and Bayou de Chien supported the same type of forest with the addition of beech for Clark's River and maple and sassafras for Obion Creek and Bayou de Chien. Loughridge cites the occurrence of sassafras trees two and one-half feet in diameter on the bottoms of Obion Creek and Bayou de Chien.

The forests of the second bottoms of the Tennessee and Ohio were composed largely of red and white oak, tulip or "pop-

lar," and hickory, with some pin oak and walnut near Birmingham in Marshall County. (11i)

The first bottoms of the Tennessee had a forest of white, red and water oaks, tulip, linn, some ash and sycamore. The bottoms of the tributaries of the Tennessee, in their lower courses, were characterized by a similar forest.



Plate XX. The forested bottoms of Mayfield Creek in its lower portion.

On the Mississippi and Ohio bottoms, the forest varied with the character of the soil. On the "back lands," there was a magnificent stand of black walnut and red gum, with cypress in the wetter portions. In addition, there was much hickory, ash, sweet gum, water and overcup oak, catalpa and pecan. On the sandy ridges, as Sassafras Ridge in Fulton County, and on the sandy front lands, cottonwood and sassafras appeared in addition to gum, oak and ash. It is said that walnut was once the chief growth on Sassafras Ridge, but that it was largely cut off and used to make fence rails. Occasional walnut trees still exist.

The quality of the land is largely indicated by the character of the tree growth. This includes not only the kind of tree, but the manner of its growth as well. The lands with hickory or walnut are generally preferable, so far as soil is concerned, to oak lands. White or black oak land is generally better than land on which post oak grows, and black jack oak generally

indicates poor soils. Large, vigorous growths, even of the poorer types of trees, may indicate a fair soil, whereas scrubby, stunted trees of the same species indicate a soil valueless for crop production. However, not only soil quality but slope as well is an important consideration in the use of the land, particularly under existing climatic conditions and because of the staples raised, corn and tobacco, so that land values are in practice an



Plate XXI. Cypress on the Ohio bottoms. Scene on a slough on the bottoms west of Barlow, Ballard County.

expression of topography as well as of soil quality. Many level tracts of only fair fertility are more available for plow land, and consequently of greater value per acre than other areas of more fertile soil lying on relatively steep slopes. It is generally true that the more desirable farming areas and the regions of greatest apparent prosperity are in the portions of least relief.

NATIVE ANIMAL LIFE

At an early date, game of many kinds was abundant, but with the exception of a few opossums, squirrels, rabbits, birds and other small forms of animal life, game has disappeared. Even these are scarce, except in portions of the swamps and in the hills adjoining the larger rivers. An occasional fox raids the barnyards of the Breaks of the Tennessee and hawks exact their toll, but the total of depredation by wild life is small.

Carrier pigeons were formerly very abundant. Nesting places of these birds for years showed traces of the fertility caused by their droppings. There are several of these so-called "pigeon roost" sections in which the fertility of the soil is still above the average, two rather well known ones occurring in Calloway County near Goshen and Faxon.

The lower courses of the permanent streams and the sloughs and lakes of the Ohio and Mississippi bottoms are fairly well stocked with fish. Some commercial fishing is done along the Ohio and Mississippi rivers, the fish being caught in trammel nets. The fish are marketed in the nearby larger centers of population. In the larger streams as well as in the smaller creeks, the water is muddy. Fishing for sport is not common in the sense that it is in the glaciated areas with streams and lakes of clear water.

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PART II.
SUBDIVISIONS OF THE PURCHASE

CHAPTER V.

SUBDIVISIONS OF THE PURCHASE

This division of the Purchase into smaller areas is based on the fact, that in different parts, topography, soil, vegetation and other factors are so combined as to produce differences in activity and opportunity. In the Purchase, these divisions commonly have some characteristic, topographic or otherwise, which is in local use in their designation. For example, the area of the hilly outcrop of the highly oxidized Ripley sands is often referred to as the "Red Hills." In the following pages, the attempt will be made to divide the Purchase into subdivisions on the basis of

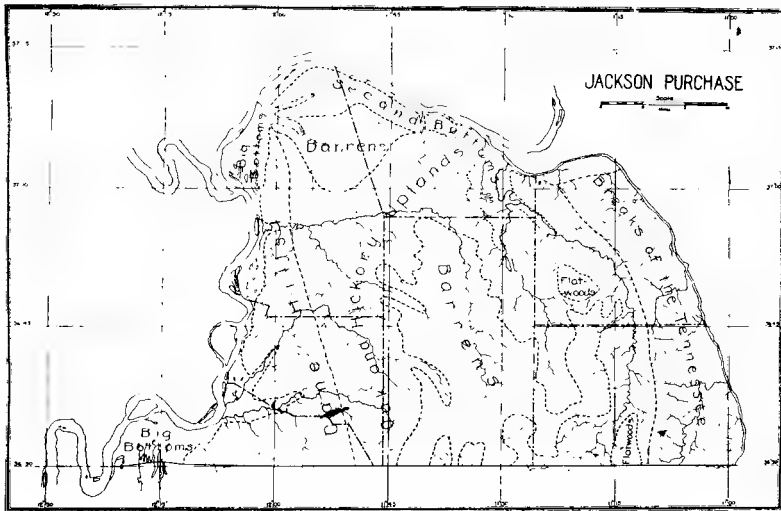


Fig. 13. Map showing the Subdivisions of the Purchase.

different opportunity and contrasted living conditions. The numerous illustrations which accompany this section are added in order to aid in conveying to the reader the differences in economic conditions which have resulted from differences in the type and amount of opportunity for development in the various portions of the Purchase. In the designation of these different divisions, names in local use will be employed where practicable.

The embayment area has had a relatively simple geological history. No great or sharp contrasts of hard and soft rocks

exist. Over all the earlier formations rests a mantle of loam, except where locally removed by erosion. Climatic contrasts, as well as great differences in topography, are lacking. Transitions are, therefore, gradual between adjacent areas so that the establishment of a precise line to separate contrasted areas is an impossibility. Again, the boundaries, if drawn sharply, would be of extraordinary complexity. The map on which these various divisions are indicated, Fig. 13, is a generalization. No attempt has been made to draw arbitrary boundaries, only to delimit in a general way and with a fair degree of accuracy, the areas of contrast.

THE BIG BOTTOMS

The bottoms of the Mississippi and Ohio embrace an area of approximately 150 square miles of fertile alluvium, interrupted by long sandy ridges and traversed by sloughs roughly



Plate XXII. A slough on the Ohio bottoms to the west of Barlow in Ballard County.

parallel to the rivers. These bottoms reach their greatest development in Fulton County, where the alluvial plains make up 40% of the area of the county. Again, to the north, the Mississippi and Ohio bottoms expand in width, comprising 25% of Ballard County.

In the counties north of Fulton, these lands are overflowed at high water stages of the Mississippi and Ohio. Houses are,



Plate XXIII. House on a sandy ridge, set on posts to escape floods. On the Ohio bottoms west of Barlow, Ballard County.

therefore, built on the highest land, either near the river or on the sandy ridges which constitute the only cultivable land away



Plate XXIV. House located on an Indian mound to escape floods. Ohio bottoms west of Barlow, Ballard County.

from the front lands. Occasional Indian mounds, which rise above even the highest of the river floods, are situated on these bottoms and are sometimes utilized as sites for buildings. Where

such artificial elevations are not available, the houses are set on posts, the barns are provided with an approach to the second floor so that stock can be protected during high water and occa-



Plate XXV. Schoolhouse set on posts to escape floods. Ohio bottoms west of Barlow, Ballard County.

sionally a bridge will be built from house to barn. Even the schoolhouses are similarly elevated on posts to escape the danger from floods. These undrained and unprotected bottoms are



Plate XXVI. View across bottoms not under levee. West of Barlow, Ballard County.

sparsely populated, even today. Roads are poor and communication is difficult a large portion of the year, even when the rowboat is not the only means of travel.

Southwest of Hickman, in Fulton County, the bottom land is protected from flood by levee. Prior to the construction of this protection, conditions were much the same as farther north. Today, the fertile land is largely in use in the production of cotton and corn. Houses are of the usual type, without posts to elevate them above floods. Settlement is relatively dense and the houses are not widely separated. The land, being perhaps the most productive and valuable land of the Purchase, is mostly in large holdings and operated by tenants, who are largely negroes. These bottom soils dry out earlier than do the upland soils. This condition allows early planting and consequent early maturing of crops. On the sandy portions of these bottoms, crops suffer severely during prolonged periods of drought.



Plate XXVII. View across bottoms under levee. Corn and cotton on the Mississippi bottoms west of Hickman.

The Big Bottoms are distinctly different from any other portion of the Purchase. They differ from the other areas in topography, soils, in crops raised, and in the character of the population. They stand out distinctly as an area of different opportunity and distinctive response.

THE CANE HILLS

To the east of the Big Bottoms lies the Cane Hills region. Used in this connection, the term embraces not only the highly dissected bluffs which face the bottoms, but the more level and less dissected loess covered area to the east as well. The deeply

eroded bluffs owe their narrow, steep sided ravines or "Gulfs," their flat topped areas between the ravines, their extraordinarily diverse and luxuriant forest cover, and their fertility to the

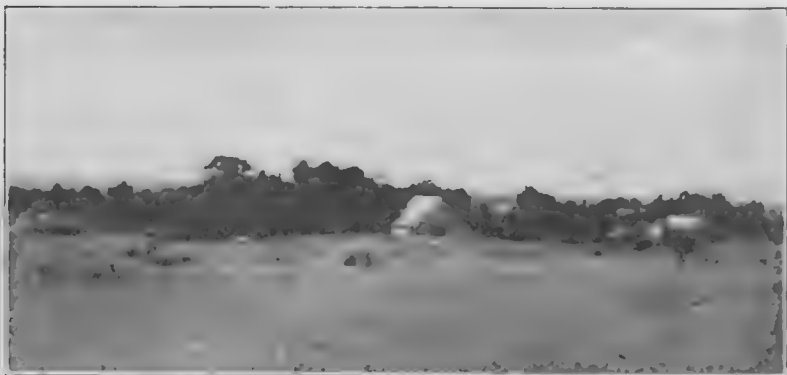


Plate XXVIII. In the more rolling portion of the Cane Hills area of Hickman County.

underlying calcareous silt, the loess. To the east, in Ballard, Carlisle and Hickman counties, the rolling to hilly upland, and



Plate XXIX. One of the better homes in the Cane Hills region of Hickman County.

in Fulton County, the more level area to the east of the Hickman bluffs, also owe their fertility and their relative freedom from soil erosion to the underlying loess. The western margin of this

division of the Purchase is definite, but to the east, the loess merges gradually into the yellow brown loams of the central

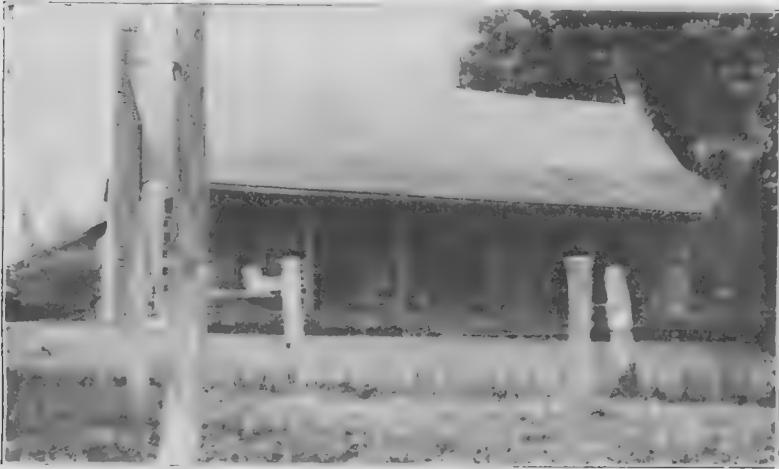


Plate XXX. An attractive log house in the loess area of Ballard County.

uplands. Reference to Fig. 13 will show that the line of division has been drawn in a northwest-southeast direction through



Plate XXXI. In the level portion of the loess area of Fulton County near Jordan.

Ballard, Carlisle, Hickman and Fulton counties, paralleling roughly the line of the Illinois Central Railroad.

Where the slopes are not too steep for successful cultivation, the highly fertile soils admit of productive agriculture. Even in the comparatively hilly portions, the farms appear prosperous, as the loess allows the use of rather steep slopes without excessive soil wash. Log houses are not common and the farms in general have a prosperous, well kept appearance as compared to farms in other sections of comparable topography. In the southern portion, in Fulton County, where the land surface is gently rolling but not hilly, the best and most prosperous farms of western Kentucky are found. The houses are good, the yards are large and attractive and the buildings in good repair.

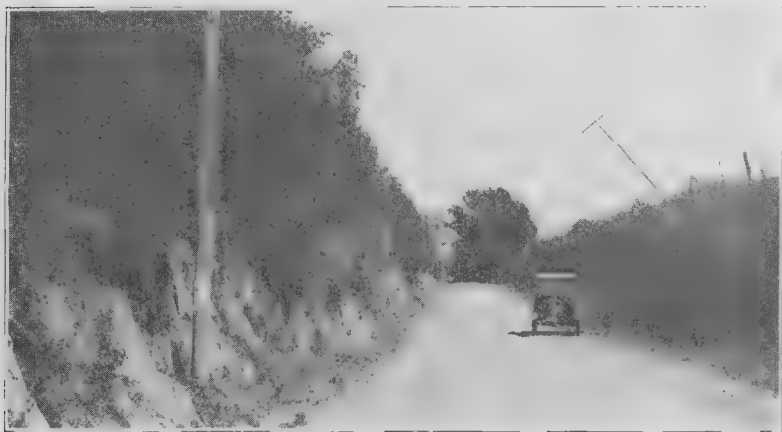


Plate XXXII. A roadside in the loess area west of Cayce, Fulton County. The loess stands in vertical faces along the roadside.

It is especially in these gently rolling loess areas that farming has been put upon a permanent basis. Agriculture as commonly practiced in many sections of the Purchase consists of "soil mining." The "mineral product" is tobacco and the final result is ruined land. Here, however, crops are raised without soil deterioration. Agriculture is as it should be and prosperous communities are the result. The Cane Hills area is generally conceded to be a distinct portion of the Purchase, characterized by opportunity above the average.

THE BARRENS

On the basis of topography, soils and native vegetation, it is easy to delimit this area and to separate it from the surrounding sub-regions. It is the region of the yellow silt loams, lying on the flat interstream areas which were characterized at an early date by a grassy or prairie type of vegetation, since supplanted in part by black jack and red oaks. Drawing the limits on a map or describing them is more difficult. Reference to the detailed soil map of Graves County, Fig. 11, will reveal the extraordinary complexity of the boundary. Included within the boundaries as shown in Fig. 13, are certain small hilly portions of divergent characteristics. Likewise, creek bottoms are of necessity embraced within the limits as drawn. The region as blocked out on the map consists essentially of original prairie with minor areas of wooded hilly slopes and creek bottoms.



Plate XXXIII. A view in the Barrens south of Mayfield showing corn on either side of the branch.

The soils are of no more than average fertility, and in many of the more poorly drained sections, they are distinctly inferior. Agricultural prosperity here is an expression of topography rather than of soils. Agriculture in the Barrens is exploitive in character, based on the raising of a money crop, tobacco, and the cultivation of corn. Fortunately, the relatively flat surface minimizes soil wash so that soil exhaustion is not accompanied by total destruction of the land, which would occur in a region

of greater relief. The farms are fairly prosperous by comparison with the farms of the poorer sections. Though one of the better regions, it is distinctly below the two previous divisions in promise and performance.

THE SECOND BOTTOMS

Embracing an area somewhat greater than the first bottoms, the second bottoms border the Ohio and Tennessee and extend up Clark's River to Kaler. They attain their maximum width of nearly six miles in Ballard County, narrowing to less than a mile in width along much of the Tennessee and Clark's River valleys.

These bottoms, built during late Wisconsin geologic time, are rather flat land surfaces like the Barrens, but have been made a separate division on account of the character of the original forest cover and the difference in their topographic position. Boundaries are easy to determine, as the line of separation from the upland areas against which they lie is fairly sharp and they are separated from the first bottoms by a distinct escarpment.

The soils are poorly drained and heavily leached, or in local parlance, crawfishy, in many of the flatter, more poorly drained portions. Loughridge said of the area in 1888: "The flat lands—are scarcely in cultivation, except in a few small patches near Paducah." Although this condition has changed, the area is only fair in its possibilities, ranking below the bottom land and the loess area.

OAK AND HICKORY HILLS

This division, which embraces the hilly uplands, with the exception of the Cane Hills and the Breaks of the Tennessee, is the largest single division in the Purchase. Every county is represented within its limits. The soils are yellow brown loams of fair fertility. The topography varies from the distinctly hilly type to rolling ridge lands.

This is a region of great and sudden variations in living conditions. Where slopes are steep and soils are thin, successful cultivation of the land, except in the bottoms, is impossible. Attempts to put such slopes to agricultural use always result

in fields ruined by erosion. The small percentage of land which can be cultivated or utilized under present farming practice,

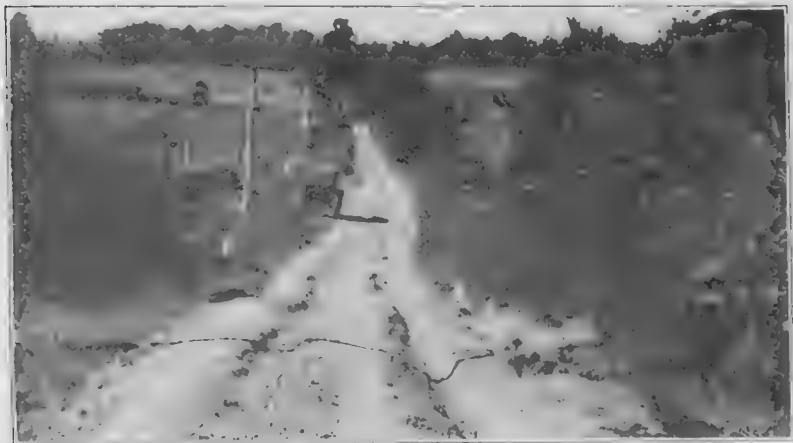


Plate XXXIV. In the Oak and Hickory Hills of southern Graves County. Moderately hilly topography.

coupled with the small size of the farms, results in poverty. Houses are unpainted one or two-room structures; barns are

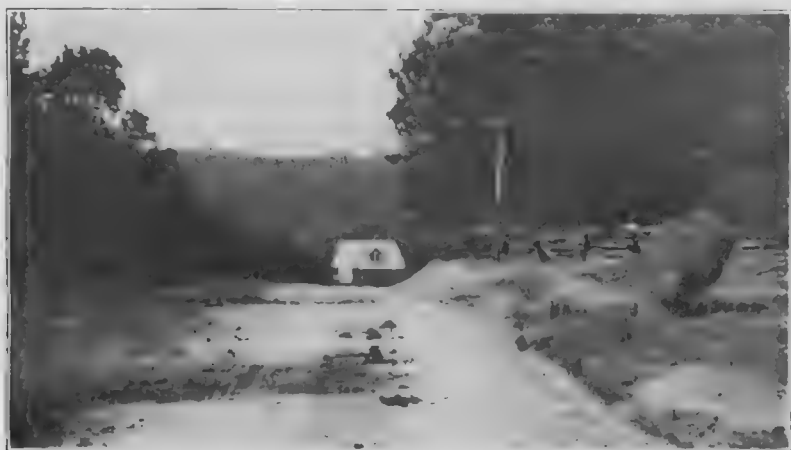


Plate XXXV. In the hills of eastern Graves County. An area of steep slopes and thin soils. The boulder by the roadside is an ironstone conglomerate.

represented by a few sheds. Log houses are of frequent occurrence, though with the disappearing forest resource, new ones are not being constructed.

On the rolling ridge land, where soils are thicker and soil erosion is reduced, so that successful cultivation of a larger percentage of the land is possible, the farm houses indicate the better conditions which exist.



Plate XXXVI. A typical frame farm house and outbuildings in the Oak and Hickory Hills. Graves County, east of Mayfield.

Much of this area is rather far from a railroad, and because of topography, the roads are poor, badly washed and often



Plate XXXVII. A log house in the hills of southwestern Graves County.

flanked by deep gullies. When fields are allowed to remain idle for a year, sassafras and persimmon take possession. As the

growth of such sprouts is rapid (See Plate XIX), this gives the country a peculiarly unkempt and neglected appearance.



Plate XXXVIII. A farm house on the rolling ridge land of eastern Graves County. Stock watering pond in the foreground.

This division is separated from the Barrens on the basis of soils, topography and native vegetation. It is a distinct division with rather limited and too often declining agricultural possibilities on account of the steep slopes. Taking the entire section into consideration, it is probable that at least 40% of the land would be put to its best use if allowed to remain in forest. Present use of the land has led to living conditions which mark the area off sharply from its neighbors.

THE FLATWOODS

These two small portions of Marshall and Calloway counties are entirely surrounded by the Oak and Hickory Hills. They differ in some respects from the larger prairie region, the Barrens, and so have been given separate consideration, though they are of small areal extent.

Although the soils of the more poorly drained portions are white and crawfishy, much of the surface is higher and better drained, so that as a whole, the Flatwoods constitute a fairly prosperous farming section, with well kept buildings and

grounds. Roads in this portion are very narrow, most of them not exceeding 16 to 18 feet between fences. In addition, they are clayey, as the Porter's Creek clay lies close beneath the surface, so that during wet weather, they are almost impassable.



Plate XXXIX. A comfortable farm home in the Flatwoods of southern Calloway County, with the ever present tobacco in the foreground.

THE BREAKS OF THE TENNESSEE

The Breaks of the Tennessee embrace the excessively hilly eastern portions of Marshall and Calloway counties. This dissected region comprises the larger part of Marshall and about 30% of Calloway County.

Some of the farms in this area are more than 16 miles from a railroad by roads which are hardly worthy of the name. Most of the north and south roads are virtually impassable with a load at any season of the year as they cross the steep ridges between the tributaries of the Tennessee. The slopes, in addition to being extremely steep, are badly washed. Main roads follow either the ridges or the bottoms, usually the latter, as the ridges are commonly short and discontinuous. Even the more traveled roads are impassable much of the time, especially after rains when the creeks "get up," for bridges over small streams are almost unknown in this section.

Farms are relatively large, embracing as much as 240 acres, though 160 acre farms are more common. The percentage of the land which can be cultivated is usually from 20% to 30%,

so that the area under plow for one farm does not ordinarily exceed 40 acres. Some of this plow land may be on the level portions of the ridges, but the best of the farm land is on the creek bottoms.

Soils vary considerably, but are apt to be sandy in patches, as this is in part the area of outcrop of the Ripley sands. Erosion has been effective for such a long period that the overlying formations have been removed in large part from the Lafayette gravels which here often lie only a few inches below the surface.



Plate XL. A view across the hills of Marshall County.

This is an area of great poverty. Cultivated areas are small; soils are poor; markets are often difficult to reach. The valuable timber which formerly covered the slopes is largely gone. Houses are closely grouped along the bottom roads and are frequently built of logs, sometimes with only one room, though often there are two rooms with a center hall. If of frame construction, the houses commonly also have only one or two rooms and are unplastered and unpainted. Roofs are frequently of hand-split shingles or "boards" as they are sometimes called. These shingles are still split out of oak bolts when a roof needs repairing.

This portion is, at the present time, the most isolated, the most sparsely populated, and the most poverty stricken of any of the subdivisions of the Purchase. It is distinctly an area of

limited resources in an agricultural way and agriculture is the only use to which the land is put at the present time. of the area, 75% is suited only to the growing of forests and any plans



Plate XLI. A typical log house with roof of hand split shingles in the Breaks of the Tennessee, Calloway County.

that are made to insure the future prosperity of the section will need to include the restoration of the forest cover to the steeper slopes.

PART III.
THE ECONOMIC SITUATION

CHAPTER VI.

THE LAND AND ITS USES

UNIMPROVED LAND

The greater portion of the unimproved land is in the broken country bordering the Tennessee and its tributaries and in the undrained areas along the Ohio and Mississippi. Where topography admits and drainage is good, practically all the available land has been put under the plow. The woodlands and other unimproved lands, whether in farms or not, represent land too wet, too hilly or with too thin soils to permit the successful growing of crops. To these three classes of lands out of agricultural use, must be added the fields once used but now lost because of soil erosion.

The entire state has witnessed an increase in the acreage of improved farm land for each decade prior to 1910, but between 1910 and 1920, there was a decrease of 378,725 acres in the area of improved farm land in Kentucky. During the same ten years, however, the area of improved farm land in the Purchase increased 21,139 acres. This gain occurred in Calloway, Carlisle, Hickman, Fulton and Marshall counties, where the clearing of farm woodlots alone added 56,024 acres to the cultivated area, enough to offset losses by soil erosion in those counties and to overcome the loss of 5,515 acres in Ballard, Graves and McCracken counties.

The fact that the past decade has witnessed an increase in the improved acreage in the Purchase should not lead to the conclusion that the next decade will see another similar addi-

Numbers in parentheses refer to the chapter bibliography at the end of the chapter.

All statistics in Chapter VI, unless otherwise stated, are taken from the Fourteenth Census. Although the war greatly disturbed economic conditions, occupations remained essentially unchanged. With the exception of a marked stimulation in the production of certain crops, notably tobacco, and the speculation in land which followed as a result, the changes were not revolutionary in character, therefore the figures represent essentially the normal production and economic situation.

GAIN AND LOSS OF IMPROVED FARM LAND FOR THE DECADE 1910-1920

Name of County.	Gain in Area of Improved Farm Land by the Clearing of Woodland.	Gross Loss of Cultivable Acreage Largely Thorough Erosion.	Net Loss of Cultivable Acreage.	Net Gain of Cultivable Acreage.	Total Remaining Unimproved Acreage.
Ballard	3,225 A. (2.0%)	5,823 A. (3.6%)	2,598 A. (1.6%)		52,309 A. (32.4%)
Calloway	20,847 A. (7.8%)	8,022 A. (3.0%)		12,825 A. (4.8%)	100,334 A. (38.0%)
Carlisle	6,070 A. (4.7%)	3,503 A. (2.7%)		2,567 A. (2.0%)	45,339 A. (35.0%)
Fulton	2,232 A. (1.8%)	**		8,456 A. (6.8%)	39,694 A. (32.0%)
Graves	18,783 A. (5.3%)	19,307 A. (5.4%)	524 A. (0.1%)		93,224 A. (26.0%)
Hickman	2,114 A. (1.4%)	723 A. (.5%)		1,391 A. (0.9%)	29,756 A. (20.0%)
McCracken	5,704 A. (3.7%)	8,107 A. (5.3%)	2,403 A. (1.6%)		51,570 A. (33.0%)
Marshall	24,761 A. (11.7%)	23,336 A. (11.1%)		1,425 A. (0.6%)	79,368 A. (37.0%)

**Gain by drainage.

(Data from U. S. Census.)

Numbers in parenthesis indicate the percentage of the total land area of each county.

tion. There still remains some overflowed land which will be drained eventually, and small additions may be made by clearing uplands, but the total is not large. If the present rate of loss of improved land, largely through soil erosion, continues, clearing and draining cannot be expected to add enough to offset the loss. In Marshall County, for example, gain by clearing between 1910 and 1920 only slightly exceeded losses by erosion. As Marshall County possesses a total of only 79,368 acres of unimproved land, at least 50% of which is unavailable for agriculture, gains by clearing and drainage cannot overcome losses by soil erosion for any extended period unless farming conditions change radically. A similar condition exists in every county in the Purchase. Shrinkage of the total improved acreage has already begun in the counties in the Barrens, Ballard County alone having lost 2,598 acres of improved farm land in the past ten years. In all the counties, much of the land on the steeper slopes must eventually revert to forest or be added to the acreage already ruined by erosion. In either case, the result will be a decrease in the total improved acreage.

What has been indicated as occurring during the period between 1910 and 1920 is only a continuation of what has been happening for the past forty years. As long as the amount of uncleared land was sufficiently large, however, there was each year a net increase in the acreage of improved farm land. The percentage of increase of improved acreage has decreased with each succeeding decade, while the percentage of loss through soil erosion has increased, until in 1920, the result was a net loss of improved acreage in three counties: Ballard, Graves and McCracken. This is indicative of the trend and forecasts the future for the remaining five counties, where similar conditions exist.

Nearly 70% of the unimproved land is included in farms. In many individual farms in the Breaks of the Tennessee, the percentage of unimproved land is from 60% to 80% of the entire farm. The remaining 30% of the unimproved land, not included in farms, is largely overflowed land along the larger rivers. Much of this class of land is held in large blocks, either because of valuable timber or on account of the speculative

value which attaches to land which at some future time may be drained.

The unimproved land, aside from very limited areas of thin soils, falls into two classes: (1) the forested areas and (2) abandoned fields, ruined by cropping and subsequent soil erosion. Of the forested area of approximately 424,000 acres, nearly 65% is embraced in farm woodlots which are rapidly decreasing in size. Woodland in farms decreased from 615,379 acres in 1880 to 260,939 acres in 1920, in spite of an increase in both the number of farms and the area of land in farms. A continuation of clearing at the present rate will eliminate all woodland in farms by 1950. The balance of the forest, or 35%, is found on the overflowed lands bordering the larger rivers and in very limited adjacent hilly areas. Cut over uplands are rapidly added to the improved area and the same is true of bottom lands, not excessively wet. Ruined fields, which comprise the second class of unimproved lands, at present total 4.5% of the area of the Purchase or 6.6% of the area of all the improved farm land, but both their actual extent and relative importance are increasing rapidly.

The table which follows indicates conditions as they exist today. Improved land in farms constitutes too high a percentage of the land surface in view of the hilly character of much of the country. Unimproved land, other than woodland in farms, represents fields ruined by cropping and erosion. A continuation of present trends indicates a great increase in the area of this type of land unless remedial measures are adopted.

1920 LAND TABLES.

County	Area of county in acres.	Improved land in farms, acres.	Percentage of land surface improved.	Woodland in farms, acres.	Other unim- proved land in farms, acres.	Unimproved land not in farms, acres.	Total unim- proved land, acres.	Percentage of land surface unimproved.	Percentage of total surface unimproved farm land.
Ballard	161,280	108,971	67.5%	29,766	3,273	19,720	52,309	32.5%	20.4%
Calloway	263,680	163,346	61.9%	62,907	16,804	20,623	100,334	38.1%	30.2%
Carlisle	126,720	81,381	64.2%	17,790	3,028	24,521	45,339	35.8%	16.4%
Fulton	123,520	83,826	67.8%	16,100	1,820	21,774	39,694	32.2%	14.5%
Graves	352,640	259,416	73.5%	47,084	17,954	28,186	93,224	26.5%	18.4%
Hickman	144,000	114,244	79.3%	25,118	3,247	1,391	29,756	20.7%	19.6%
McCracken	152,960	101,390	66.2%	20,764	5,628	25,178	51,570	33.8%	17.2%
Marshall	209,280	130,219	62.2%	41,410	15,349	22,609	79,368	37.8%	27.1%
Total	1,534,080	1,042,793	67.9%	260,939	67,103	163,552	491,594	32.1%	21.3%

Data from 14th Census.

TIMBER AND ITS USES

At an early date, a heavy mixed stand of valuable hardwood covered both the hilly uplands and the bottoms. As late as 1891, when the branch of the Nashville, Chattanooga & St. Louis Railroad, which runs south from Paducah through Murray, was constructed, Marshall and Calloway counties were still heavily forested, timber being one of the minor inducements for railroad construction. Today, most of the valuable upland timber has been removed; the present stand, which covers approximately 300,000 acres or 20% of the total land area, is mostly second growth of inferior kinds.

The total amount of unimproved land, 491,594 acres, or 32% of the area, represents somewhat more than the extent of the present timber land. Of this unimproved acreage, 260,939 acres are embraced in woodland in farms, representing an average of 11.7 acres of woodlot per farm. These figures convey an exaggerated idea of the extent of the resource, as much of the land in timber has had the better trees cut or has badly washed slopes with inferior stands, both as to kind and quality. The large concentration of the timber remaining in farmer's wood lots is indicative of the approaching exhaustion of the resource.

The small amount of timber which remains is being cut rapidly. The area of woodland in farms decreased from 340,211 acres to 260,939 acres between 1910 and 1920 which, though slightly less than the rate of decrease during the two preceding decades, will mean the disappearance of the woodlots within a period of less than forty years if the present rate of cutting continues. What forest still remains is mostly in the hilly border of the Tennessee and the bottoms of the Mississippi, Ohio and some of the larger creeks. Though the best is gone, considerable timber is cut, particularly along the rivers. In Marshall and Calloway counties, white and post oak is made into ties, these being carried by towboat and barges to distributing points downstream. The industry at present is carried on in a small way as the timber supply is limited. Sawmills are mostly of the small, portable type which are readily moved as the supply of timber is exhausted. On the Mississippi and Ohio bottoms, small scale logging operations are also carried on in the few remaining hardwood tracts.

Some of the timber is used locally in a box and veneer factory at Hickman and in a "handle factory" at Wickliffe. In Paducah, the woodworking industries, which employ nearly 800 men, draw in part upon these remaining forest supplies for their materials.

Wood is still a common household fuel, except in limited portions of the Barrens, and supplies as well the small potteries



Plate XLII. Present day roadside scene in the uplands which were formerly covered with heavy timber.

and manufacturing plants in the same localities. Wood is able to compete successfully with coal because of its low cost, the price for four-foot oak wood delivered varying from 75 cents to \$1.00 per cord in southeastern Calloway County to \$2.50 to \$3.00 per cord in Graves County, these being the prices paid by the potteries in 1920 and 1921. These prices are a commentary on standards of living in some sections of the Purchase. They represent: (1) no valuation of the timber, (2) an extremely low wage return at cutting wood, indicating a serious lack of cash.

DRAINAGE

Many of the creek bottoms are subject to overflow at high water stages of the creeks. In addition, in all the counties along the Ohio and Mississippi, high water causes overflow of considerable areas. Drainage enterprises in western Kentucky are

for the purpose of relieving these bottom lands which are subject to overflow, either by deepening and straightening the creek channels or by the construction of levees in association with ditches to carry off surplus water.

In Kentucky west of the Tennessee River, there is a total of more than 30,000 acres of farm land needing drainage. There are also at least 100,000 acres, not in farms, which need drainage. Of this total of 130,000 acres, at least half can be drained.* Present operating drainage enterprises protect a total of 18,619 acres.

There are, at present, 218 farms in drainage and levee districts, 387 farms having drainage, and 1,118 farms needing drainage. In Fulton County, the number of farms needing drainage is 243 or 20.1% of the total number of farms in the county. In Hickman County, 189 or 11.5% of the total number of farms need drainage. As used in this connection, drainage does not include the prevention of overflow by levees where such construction is not accompanied by open ditches or tile drains to carry off surplus water. (3)

In Ballard County, 5,414 acres of overflowed land have been made available for crop production by 21 miles of open ditch at a cost of \$7.73 per acre; in Hickman County, the dredging of Obion Creek has rendered 4,879 acres available at a cost of \$6.19 per acre; in northeastern Marshall County, 5,180 acres of bottom land at the headwaters of Big Cypress Creek have been freed from danger of overflow at a cost of \$14.94 per acre. (3) These projects are all open ditches without accessory levees or dikes. The bottom land thus added to the area of improved farm land is fertile, except where excessively leached. The principal crop grown on these drained bottoms is corn.

In addition to the operating enterprises, Mayfield Creek is being deepened and its channel straightened, the dredging beginning at Boaz. The project, when completed, will drain several thousand acres as well as improve conditions on the main traveled highway between Paducah and Mayfield.

The dredging of Clark's River is also contemplated and will probably be an accomplished fact within a few years, as the

*These areas are personal estimates.

pressure on the land is increasingly great from year to year and the cost per acre of reclaiming the land is not excessive.

The largest single district which has been protected from overflow by levee is in western Fulton County, where an embankment, which was constructed in 1908 to prevent overflow by the Mississippi, extends from Hickman to the Tennessee boundary. This levee affords flood protection to over 21,000 acres, or approximately 16% of the total area of Fulton County.



Plate XLIII. Deepening and straightening the channel of Mayfield Creek, near Boaz in Graves County.

Any appreciable future expansion of the improved land must come from an extension of drainage projects. Many critical upland slopes, which are now being cropped, will soon wash so badly that they will be allowed to revert to forest. The decrease in the area of improved farm land in the uplands, which has already begun in three counties, will spread to every upland county. Only on the bottom lands, where it should be possible to add at least 60,000 acres to the drained area, is any further extension of agriculture possible or desirable.

IMPROVED LAND FARMS

During the past twenty years, the following tendencies have manifested themselves in the farms: (1) There has been a great increase in the number of farms. (2) There has been a moderate

- increase in the total amount of improved lands in farms.
 (3) There has been a marked decrease in the size of the farms.
 (4) Land has increased greatly in value.

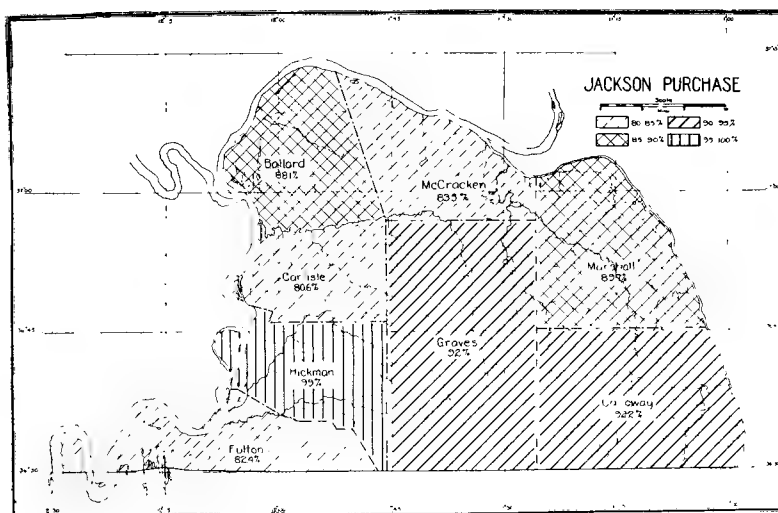


Fig. 14. Percentage of land in farms. (Data from 11th Census.)

NUMBER OF FARMS 1880-1920.

	Ballard	Callaway	Carlisle	Fulton	Graves	Hickman	McCracken	Marshall	Total Number of Farms	Total Land in Farms
1920	1979	4293	1437	1205	6082	1649	2128	3353	22,126	1,371,528
1910	1983	3464	1372	1185	5162	1511	1923	2877	19,477	1,381,669
1900	1449	2798	1441	1001	4526	1432	1559	2281	16,478	1,341,590
1890	930	2129	962	837	3501	1421	1066	1757	12,603	1,233,326
1880	*897	1976	*921	704	3543	1397	1118	1443	11,999	1,204,167
Percentage of increase 1880-1920	% 221	% 217	% 155	% 171	% 171	% 118	% 190	% 232	% 184	% 14%

*Estimated.

INCREASE FOR ALL COUNTIES.

1910-1920	Number of farms.....	2649	Percentage increase.....	13
1900-1910	Number of farms.....	2999	Percentage increase.....	18
1890-1900	Number of farms.....	3875	Percentage increase.....	30
1880-1890	Number of farms.....	604	Percentage increase.....	5

Data from U. S. Census.

The increase in number of farms is only in small part the result of an expansion of the area included in farms, as there has been comparatively little addition to the land in farms during the past forty years. During this period, the farms have nearly doubled in number, while the land in farms has increased only 14%. The increase in number is largely due to subdivision of previously existing farms with an accompanying reduction in size of the individual farm.

The actual increase in number of farms, as well as the percentage of increase, was greatest for the decade ending in 1900 and has fallen with each succeeding ten-year period. This would indicate that increase in the number of farms by subdivision is reaching its limit. In the loess area, the limit has already been practically reached, as the percentage of increase for the counties in the loess area for the ten-year period ending 1920 was only 3%, as against 18% for the other counties and 13% for the entire Purchase. Further, the 3% of increase occurred mostly in the eastern portions of those counties, where the loess gradually gives way to the yellow and yellow brown loams.

Subdivision has been most active in Calloway, Graves, Marshall and McCracken counties, and in the eastern portions of the western tier of counties, where the growing of tobacco has made the small farm a possibility. Where the farmer and his family do the work and raise tobacco as a major crop, it is impossible to work a large farm, as the labor demands of the tobacco are excessive. As the money return per acre of tobacco is high, the growing of a small acreage yields a sufficient revenue. This is what has made the great increase in the number of farms in the tobacco growing districts a possibility.

AVERAGE SIZE OF FARMS IN ACRES, BY DECADES 1880-1920.

	Ballard	Calloway	Carlisle	Fulton	Graves	Hickman	McCracken	Marshall	Average for the Purchase	State Average
1920	71.8	56.6	71.1	84.4	53.3	86.5	60.0	56.0	61.9	79.9
1910	73.2	69.7	75.7	75.9	65.1	88.3	68.7	69.5	70.9	85.6
1900	90.6	83.3	79.2	87.0	72.6	82.1	85.7	86.4	81.4	93.6
1890	134.0	104.0	97.0	97.0	91.0	86.0	97.0	99.0	98.1	119.0
1880	121.0	103.0	*	117.0	89.0	89.0	92.0	108.0	100.3	129.0

*County not organized, part of Ballard.

Data from U. S. Census.

The average farm in the Purchase is today below the state average in size. The same has been true for the past forty years and also the gap between the state average and the average for this region has widened steadily since 1900. Only in the counties of the loess area are the farms above the state average in size.

Farms have decreased steadily in size in every county in the Purchase during the past four decades, but the decrease has been rather slight in the loess area and very pronounced in the tobacco raising districts. The average farm size for the entire Purchase is not excessively low, but the farms in Calloway, Graves, McCracken and Marshall counties are very small, especially when the hilly topography of large portions of these counties, which decreases the percentage of land possible to put to permanent agricultural use, is taken into consideration.

As stated in connection with the discussion of the increase in the number of farms, the small size of the farm in these counties is possible because of the importance of tobacco as a crop, the high per acre returns from tobacco growing enabling the securing of a livelihood from a small area of improved farm land. Subdivision has already gone so far, however, that with present agricultural practice and crops, it is difficult to see how any further reduction can be made without serious depression

of the standards of living. It is even possible that subdivision has already gone too far, as it is doubtful whether the farms of average size in Graves and Marshall counties, for example, devoted to the production of corn and tobacco, will support a family in comfort, according to American standards.

In the Purchase, the number of acres of improved land per farm is below the state average, but both the percentage of total land improved and the percentage of land in farms improved are above the state average. In 1920, for example, only 54.3% of the land of the state was improved as against 67.9% for the Purchase, while of the land in farms, 76% was improved in the Purchase as against a state average of 64.7%. This same relationship has existed for the past four decades. Both of the preceding statements indicate for the Purchase a productivity above the average for the state.

IMPROVED LAND IN FARMS 1890-1920.
NUMBER OF ACRES PER FARM

	Ballard	Calloway	Carlisle	Fulton	Graves	Hickman	McCracken	Marshall	Average for the Purchase	State Average
1920	55.0	38.0	56.6	69.6	42.7	69.3	47.6	39.0	47.1	51.6
1910	56.3	43.5	57.4	63.6	50.4	69.9	54.0	45.0	52.1	55.3
1900	58.6	49.0	54.3	69.0	53.2	62.3	54.3	53.1	54.9	58.5
1890	72.8	48.1	58.5	67.5	52.6	56.4	59.2	46.9	54.9	65.9

PERCENTAGE OF FARMS IMPROVED

	76.7	67.2	79.6	82.4	80.0	80.1	79.3	69.8	76.0	64.7
1920	76.7	67.2	79.6	82.4	80.0	80.1	79.3	69.8	76.0	64.7
1910	76.8	62.4	75.9	83.8	77.4	79.2	78.6	64.8	73.7	64.6
1900	64.6	58.8	68.5	79.3	73.2	75.7	63.3	61.4	67.4	62.5
1890	54.3	46.2	60.3	69.5	57.7	65.5	61.0	47.3	55.9	55.2

Data from U. S. Census.

The small acreage of improved land per farm and the decrease in the number of acres of improved land per farm result

from subdivision of larger farms. Only where subdivision of large farms has occurred has there been a decrease in the number of acres of improved land per farm. In Fulton and Hickman counties, in the loess area, there has been no great decrease in the size of the farms and an increase, rather than a decrease, in the number of acres of improved land per farm. In Marshall County, by way of contrast, where tobacco is a principal crop and farms are small, the past ten years have witnessed a shrinkage of nearly 10% in the number of acres of improved land per farm with an aggregate increase of 5% in the percentage of farm land improved.

Pressure on the land has necessitated the utilization of all available land. This has led to the clearing and temporary use of slopes which should have been left in forest. Many of these denuded hillsides are already in the process of reversion to forest and soil erosion is rapidly adding to the acreage of such abandoned fields.

LAND VALUES—VALUES PER ACRE 1890-1920 (AND 1860)

	Ballard	Calloway	Carlisle	Fulton	Graves	Hickman	McCracken	Marshall	Average for the Purchase	State Average
1920	\$68.44	\$54.03	\$61.79	\$94.34	\$65.57	\$67.40	\$72.29	\$50.05	\$61.36	\$48.62
1910	31.40	14.64	30.18	43.66	20.73	31.04	29.86	15.15	24.06	21.83
1900	12.54	6.69	14.84	24.86	10.76	20.40	12.26	6.76	11.89	13.24
1890	11.22	7.18	12.98	27.08	12.56	20.43	12.00	7.45	12.46	16.17
1860	13.76	8.60	*	22.41	9.82	11.71	12.00	7.99		

*County not organized.

Figures for 1900-1920, bare land; 1860 and 1890 figures include buildings and fences, in addition to the bare land.

PERCENTAGE OF INCREASE IN LAND VALUES BY DECADES
1900-1920.

1910-20	118	269	104	116	216	117	142	230	167	122
1900-10	150	118	103	75	92	52	143	124	102	64

Data from U. S. Census.

Prior to 1900, the average value of land in the Purchase remained almost stationary and was below the state average, but since that date, the steady increase in land values in all counties in the Purchase has altered the situation. By 1910, the average for the Purchase, and for all counties in the Purchase except Calloway and Marshall, passed the state average, and by 1920, the average land value in all counties was above the state average. This rapid increase in values has been coincident with and most marked in those counties in which there has been the greatest increase in the number of farms.

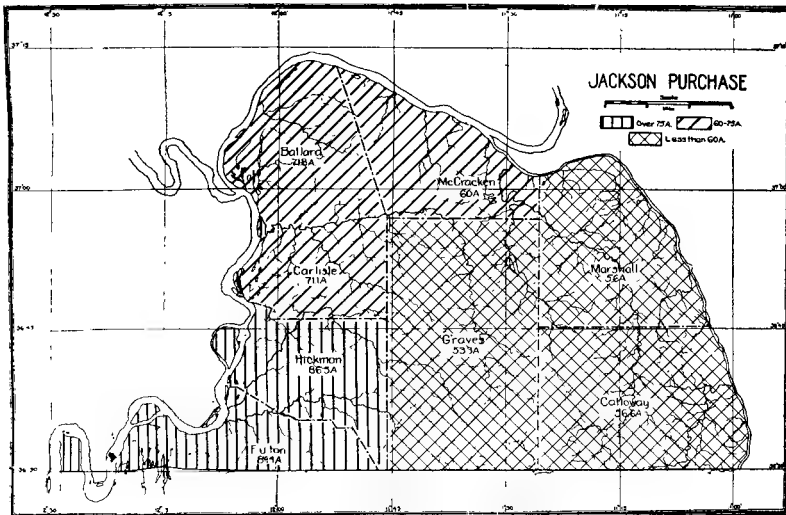


Fig. 15. Average size of farms in the Purchase. (Data from 14th Census.)

The greatest actual increase between 1900 and 1920 occurred in Fulton County, where the loess soils are of high fertility and where the construction of the levee below Hickman contributed greatly to the increased average land values. Following Fulton County, the next three counties in order of the amount of increase in land values are McCracken, Ballard and Graves, while Hickman, with some of the best soils in the Purchase, ranks fifth. Further, if percentage increases in valuation are considered, the counties of the loess area rank low, whereas Callo-

way and Marshall counties top the list. It is of interest to note the connection between the percentage of increase in valuation and the amount of improved land per farm.

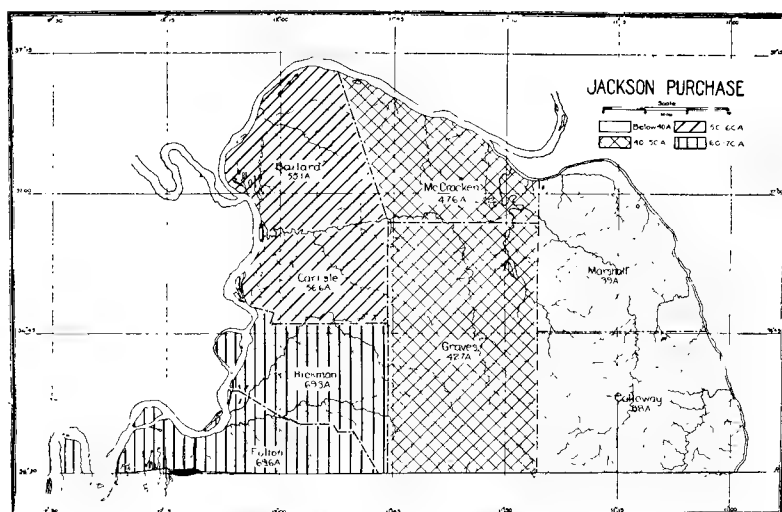


Fig. 16. Improved land per farm in the Purchase.
(Data from 11th Census.)

RELATION BETWEEN AMOUNT OF IMPROVED LAND PER FARM
AND INCREASE IN VALUATION.

Counties	Number of Acres of Im- proved Land per Farm.	Percentage of Increase in Valuation 1900-1920	Actual Increase in Valuation 1900-1920
Calloway	38.0	837%	\$47.34
Marshall	39.0	743%	43.29
Graves	42.7	609%	54.81
Ballard	55.0	545%	55.90
McCracken	54.0	508%	60.03
Carlisle	56.6	416%	46.95
Fulton	69.6	379%	69.48
Hickman	69.3	330%	47.00

Data from U. S. Census.

In this discussion of land values and the increases in land values, the bare land is considered without buildings or improvements.

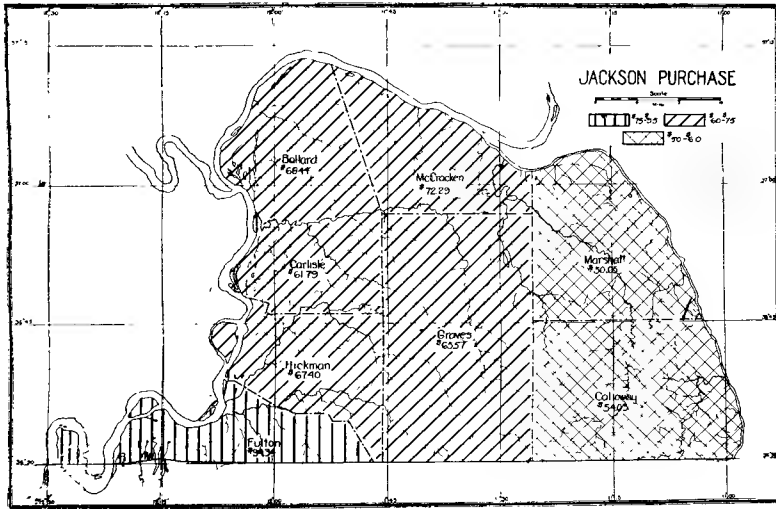


Fig. 17. Land values in the Purchase. (Data from 14th Census.)

In certain counties, special factors may influence land values, as levee construction in Fulton County, but with these exceptions, the causes affecting land values are alike in the various portions of the Purchase. In part, increases in land value have resulted from the speculation in land which occurred in the tobacco growing districts during the period of high prices for tobacco, but this affords only a partial explanation, as the increases in value were almost equally great prior to the period of speculation. There was little change in land values between 1860 and 1900, but with the great increase in the number and decrease in the size of farms, land prices rose. Where subdivision of farms was most active, the percentage of increase in valuation was greatest. The decrease in farm size has been accompanied by the growing of larger acreages of tobacco, a crop which requires much labor. The percentage of increase in land values has been greatest where tobacco is a major crop because the return per acre from the growing of tobacco will allow a

rather high capitalization of land which for other purposes would be of low value. Percentage increases in land value in the Purchase have not been largest in rich land areas, but rather the contrary.

The increases in land values have resulted in an abnormal situation, as land in the tobacco growing sections is at present too high in price, on the basis of net returns from crops raised, if labor is allowed a fair wage. For example, an average Marshall County farm consists of 56 acres of land, 39 acres of which are improved, assessed at \$3,919.00. From this farm, the gross returns from all crops are \$1,423.70 and from all sources, \$1,549.41. This was true in 1919. Today, with present tobacco prices, the gross return is much less. This is also an average condition. On many farms, the gross returns would be very much less. If expenditures necessarily incurred in raising the crops and a reasonable return on the market value of the land are deducted from the gross return, the labor return is unsatisfactory, or if a fair labor return is subtracted, in addition to the other expenses of the farm, the land does not yield a reasonable return on the investment. The smaller percentage of tenancy in these sections of smaller farms indicates the unprofitable nature of investment in such land at present prices. The desire for a home, the disinclination to move to other areas, and the shortage of land have led, not only to a great reduction in the size of the farms, but to an abnormal rise in land prices as well, in the counties where tobacco is a major crop, and where the small farms are thereby rendered possible. In Hickman and Fulton counties, the increases in land values more nearly parallel increases in land values in other states and reflect the fact that the soils are of high fertility, which is also indicated by the fact that the highest priced lands in the Purchase are in the southwestern portion.

CROP PRODUCTION (1)

Agriculturally, the Purchase ranks high by comparison with other equal areas in Kentucky. The agricultural economy is simple, the staple crops, corn and tobacco, together with the forage crops, constituting about 75% of the value of the total agricultural production. In Fulton County, cotton assumes local

importance and wheat is raised in considerable quantities in portions of the western counties on loess lands. A large variety of minor crops are also produced.

CEREALS

Corn is the great staple cereal crop, over 45% of the land cropped in any one year being in corn. It is grown in every county, though yields are higher on the better soils. In 1909, corn constituted nearly 90% of the total cereal production, and in 1919, 85.6% of the total cereal crop. In all counties, bottom lands are largely given over to corn. A typical scene on the bottoms is shown in Plate XI. The wide distribution of the crop and the production per county are shown in Fig. 18.

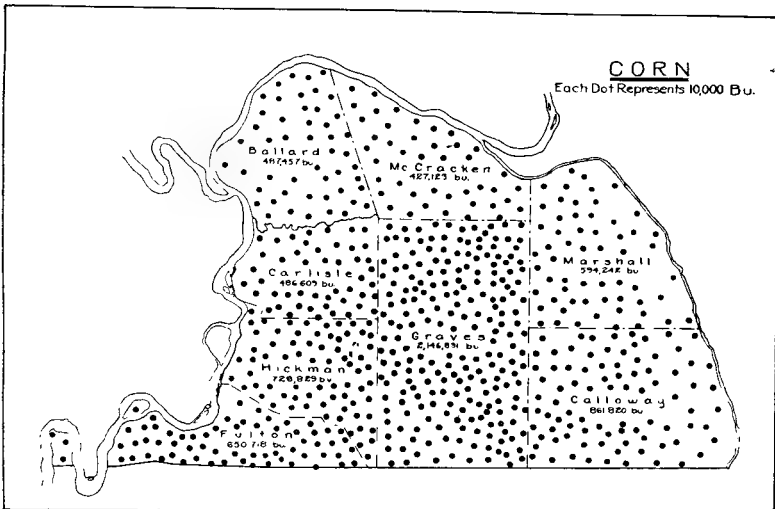


Fig. 18. Distribution of corn and county yields in bushels.
(Data from 14th Census.)

Production of corn per square mile of land surface is distinctly above the state average. Except in Graves County, however, the amount of corn grown per square mile of land surface is on the decrease. This is due to the following causes. (1) There has been a shrinkage in the area devoted to growing corn, the acreage decreasing from 309,979 to 250,664 between 1909 and 1919. (2) There has been a decrease in the yield per acre, the

result of depleted soil fertility. The counties of largest corn production on improved farm land are normally Fulton, Hickman, Carlisle and Ballard. In these counties, the hog raising industry is best developed.

CORN PRODUCTION.

NUMBER OF BUSHELS OF CORN PER SQUARE MILE OF LAND SURFACE.

	Ballard	Calloway	Carlisle	Fulton	Graves	Hickman	McCracken	Marshall	The Purchase.	The State.
1909	4300	2352	3622	4612	3121	4600	3040	2649	3365	2761
1919	1934	2091	2457	3402	3903	3194	1787	1817	2664	2369

NUMBER OF BUSHELS OF CORN PER SQUARE MILE OF IMPROVED LAND.

1909	6228	4124	5830	7609	4228	6617	4486	4288	5083	3716
1919	2867	3379	3831	5005	5300	4094	2688	2913	3914	3275

Data from U. S. Census.

Average yields for the Purchase are not high. On the better soils of the western tier of counties, corn may be considered as entitled to a place in the farm economy on the basis of yield, but in the hilly sections and in the areas of poorer soils, the reasons for growing corn are somewhat different. There corn is grown, in spite of poor yields, because: (1) It requires few and inexpensive tools for planting, cultivating and harvesting. (2) On many of the farms, machinery could not be used to good advantage, even though the cost were not prohibitive. (3) Corn gives larger yields than the small grains. (4) It yields fairly well with careless cultivation. (5) It is easily stored. (6) It can be fed directly on the farm, which is a great advantage in areas of poor roads and considerable distances to market. (7) It is the best general utility grain, serving as food for both man and stock.

In much of the hilly section of the Purchase, log houses evidence the retarded development. In such areas, corn is still ground locally in small mills and the product used as at an earlier date. Everything considered, in these hilly areas, corn is at present and will continue to be for some time the most satisfactory cereal crop. In the more desirable sections of the western counties, climatic conditions and the soils allow yields which guarantee corn a permanent place in the farm economy.

Wheat ranks second among the cereals produced, but comprised only a trifle more than 12% of the total 1919 cereal production. Further, it is less widely grown than corn, being more largely confined to the loess area. The limited extent of the area in which wheat is an important cereal crop is shown in Fig. 19.

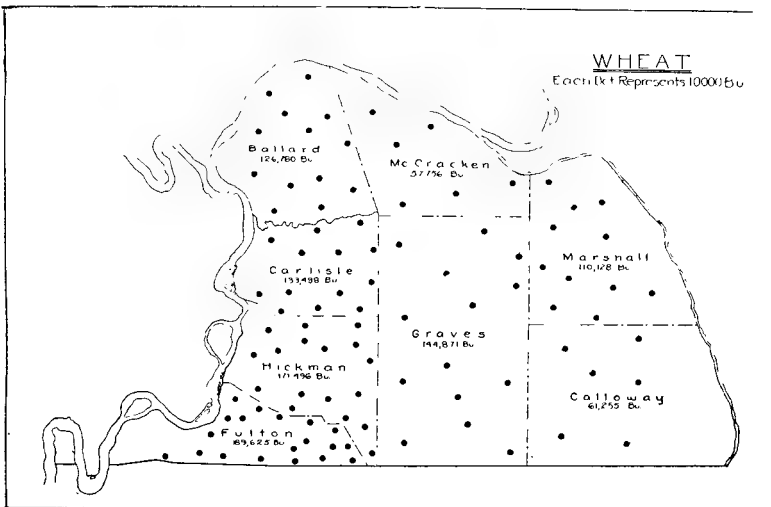


Fig. 19. Distribution of wheat in the Purchase.
(Data from 14th Census.)

In the tobacco growing counties: Calloway, Graves, McCracken and Marshall, wheat is only a minor cereal crop. In these counties, the average farm is small. Under such conditions, the growing of wheat constitutes poor economic practice. More machinery is needed than for growing corn and tobacco, and the net return per acre is less. Further, much of the agricultural land is bottom land which grows good crops of corn, but

WHEAT PRODUCTION.
NUMBER OF BUSHELS OF WHEAT PER SQUARE MILE OF LAND SURFACE.

	Ballard	Calloway	Carlisle	Fulton	Graves	Hickman	McCracken	Marshall	The Purchase.	The State.
1909	591	84	602	864	197	1155	164	119	382	289
1919	856	148	969	1426	267	1575	241	193	578	389

NUMBER OF BUSHELS OF WHEAT PER SQUARE MILE OF IMPROVED LAND.

	503	148	674	982	263	762	241	336	415	343
1909	503	148	674	982	263	762	241	336	415	343
1919	745	240	1051	1458	357	963	364	539	610	475

Data from U. S. Census.

is only indifferently suited to wheat. In the loess area, on the contrary, the farms are larger and the percentage of bottom

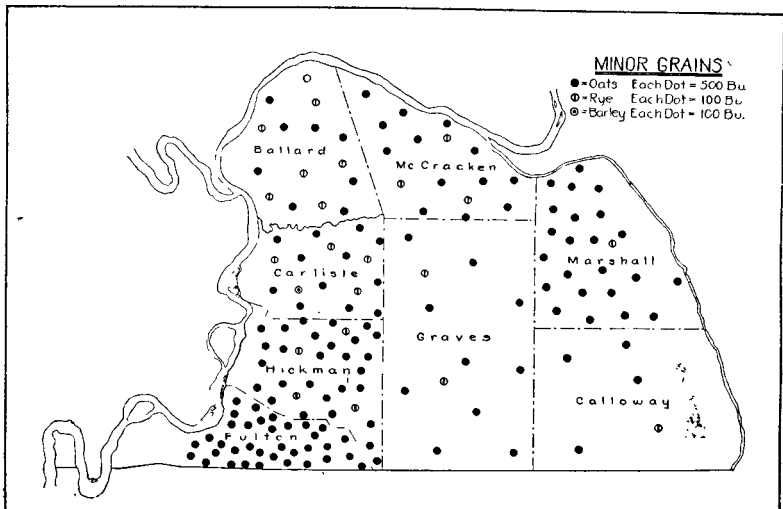


Fig. 20. Distribution of oats, rye and barley in the Purchase.
 (Data from 14th Census.)

land is less. In addition, the soils do not produce tobacco of good quality. Hence, in the counties of the loess area, a different

cropping system has been developed. On account of the high quality of the farm land employed in growing wheat, the yield is well above the state average.

The only other cereal worth mention, that is grown in the Purchase, is oats. Fulton County is responsible for 25% of the oats crop and Hickman County for nearly as much. The localization of the production is shown in Fig. 20. Small grains occupy an insignificant position in the agricultural economy of most portions of the Purchase. Climatically, the entire Purchase is suited to growing corn. Because of the advantages which this crop possesses under present economic conditions, small grains are not grown to any considerable extent, except in limited areas where the soils are of high fertility, where the farms are of fair size and where a system of crop rotation and good agricultural practice prevails.

HAY AND FORAGE CROPS

Hay and other forage crops occupied 23% of the cropped area in 1919 and amounted to a total of 110,311 tons, of which nearly 80% was timothy, clover, alfalfa and other tame grasses. The remaining 20% consisted of annual legumes, silage, small grains, kaffir corn and sorghum, corn and wild grasses, named in the order of their importance.

The Cane Hills, or the loess area, leads in the production of timothy, clover and alfalfa, Fulton County alone producing 25% of all the clover, 15% of all the timothy and clover and 73.5% of all the alfalfa grown in the Purchase. This is also an area where much stock is raised. The western tier of counties, though only about 35% of the area of the Purchase, produces 80% of the timothy, timothy and clover, clover and alfalfa grown in the entire area. In many of the counties, clover cannot be grown successfully without liming, which partially explains the dominance of the loess area in clover production. This area, together with McCracken County, or 40% of the area of the Purchase, grow 54% of the total production of forage crops of all kinds.

One of the most encouraging indications of improving farm practice in the Purchase is that both the acreage devoted to the production of hay and forage crops and the yield per acre have

increased noticeably in the past decade. For the decade ending 1919, the acreage increase totalled 17,494 or 21%, while the yield increased from .98 T. to 1.1 T. per acre. The increase in yield

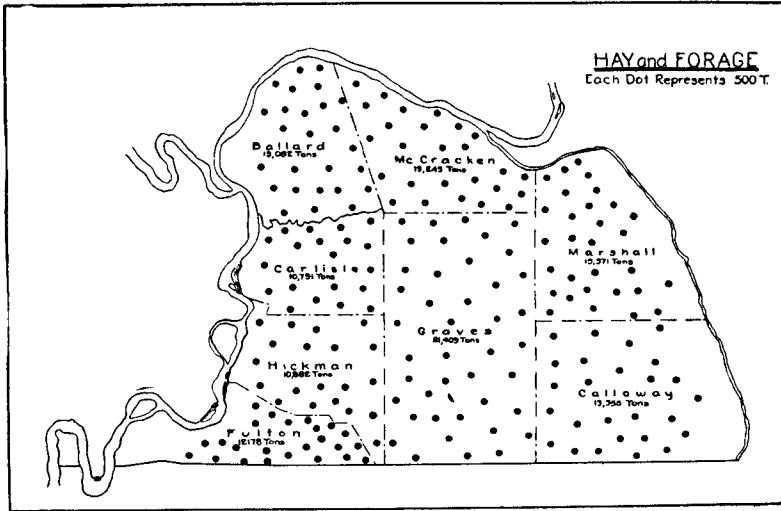


Fig. 21. Hay and forage crops in the Purchase.
(Data from 14th Census.)

is largely the result of the more widespread use of lime and increasing acreage is in response to the enlargement of the live-stock industry.

SORGHUM

Sorghum is a minor crop, generally grown on bottom lands. It is grown largely for the syrup. Out of a total production of 125,199 gallons in 1919, Marshall and Calloway counties produced 52,907 gallons, or 42.2% of the total output. In the same year, Fulton County produced only 5.1% of the total as against 25% for Calloway County, where the production is in the hilly eastern section in large part. A typical sorghum field on a small creek bottom, with the plant for the extraction of the juice and the boiling of the syrup is shown in Plate XLIV.

The growing of sorghum for syrup is most common in those sections where living conditions are poorest and where log houses are of frequent occurrence. It represents an attempt to produce

all that is consumed on the farm. In pioneer communities, sorghum is commonly grown, but it tends to disappear as a crop as methods of communication improve and standards of living



Plate XI. IV. A sorghum field in Fulton County. The mill and the apparatus for boiling the syrup are shown in the foreground.

rise. In the Purchase, in the less isolated areas and in the more highly developed and prosperous farming communities, little sorghum is grown, but in the hills, it is a common crop.

COTTON (4)

Cotton occupies a secondary position among the agricultural products of Kentucky, but in Fulton County, on the Mississippi bottom lands, it constitutes an important crop. In 1880, a total of thirty-seven Kentucky counties produced some cotton, though the bulk of the production was in the Purchase even at that date, Calloway, Graves, Hickman and Fulton counties producing 1,136 bales out of a total state production of 1,367 bales. Every county in the Purchase at that time produced some cotton. By 1909, only Fulton County, with 97.6% of the total state production, grew any considerable amount, though a few bales were grown in Ballard, Graves and Hickman counties. The total production for these four counties was 97.9% of the state total of 3,469 bales. By 1919, the production was so extremely local-

ized that cotton was not listed as a crop in the Fourteenth Census. Cotton growing has witnessed a steady expansion in Fulton County, but has virtually disappeared elsewhere. This is due largely to climatic conditions. Only on the bottom lands of the extreme southwest is the growing season of sufficient length for successful commercial production. Characteristic scenes in the cotton growing district are shown in Plates XIII, XXVII and XLV. It is in this district that the greatest concentration of negro population, large land holdings and the most highly developed tenant system are found. The cotton which is produced in this area is ginned, baled and shipped from Hickman, and in smaller amount, from Fulton. Cotton growing



Plate XLV. A field of cotton in the cotton growing section of Fulton County, on the Mississippi bottom lands. The trees in the background mark the location of a slough

appears to be established on a permanent basis; average production is nearly one-half bale per acre and the acreage grown is expanding. The construction of the levee below Hickman greatly increased the area available for cotton growing. In this section, cotton replaces tobacco, the common combination of crops being corn and cotton.

TOBACCO

The "cash crop" over the major portion of the Purchase is tobacco. Corn and other grains and crops are grown for domestic consumption or for feeding stock, but tobacco is the

"money crop." Consequently, when unfavorable weather conditions occur or low prices are obtained for the tobacco, hard times result. A combination of a short crop and low prices is a serious disaster.

The period from 1909 to 1919 witnessed an amazing increase in the acreage devoted to tobacco in every county in the Purchase. During that period, the total acreage increased from 51,488 to 100,202 acres, or nearly 20% of the total area in crops, and the production from 37,800,700 pounds to 82,940,765 pounds. In 1919, Graves County alone produced the equivalent of 73.7% of the total 1909 crop. Comparative acreages and productions for the various counties in 1909 and 1919 are shown in the accompanying tabulation.

ACREAGE AND PRODUCTION OF TOBACCO 1909 AND 1919.

County	Acres planted 1909	Acres planted 1919	Pounds produced 1909	Pounds produced 1919
Ballard	6,675	10,432	5,547,967	8,464,905
Calloway	10,286	20,285	7,140,705	16,051,997
Carlisle	2,159	5,246	1,618,313	4,563,877
Fulton	665	1,820	635,643	1,737,115
Graves	18,506	33,135	13,352,333	27,877,284
Hickman	2,423	5,602	1,911,251	4,938,788
McCracken	3,651	9,277	2,734,146	7,677,903
Marshall	7,123	14,405	4,860,342	11,628,896
Totals	51,488	100,202	37,800,700	82,940,765

Data from U. S. Census.

The enormous increase in production between 1909 and 1919 was caused by the high prices which prevailed for the tobacco. Falling prices have been accompanied by a decrease in the amount of tobacco grown, the 1920 crop not exceeding 65,000,000 pounds.*

*Estimate by the tobacco buyers in the Purchase.

The loess areas are not heavy producers of tobacco for, though yields are high, the leaf is of poor quality. Most of the crop is known in Graves, Calloway and Marshall counties, which are not in the loess area. These three counties produced 33.6%, 19.3% and 14% respectively, or a total of 66.9% of the total 1919 crop. Ballard and McCracken counties are also heavy producers, these two together producing as much as Calloway County. Wherever grown, it utilizes the best soils available. Plates XI and XXXIX show typical tobacco patches.

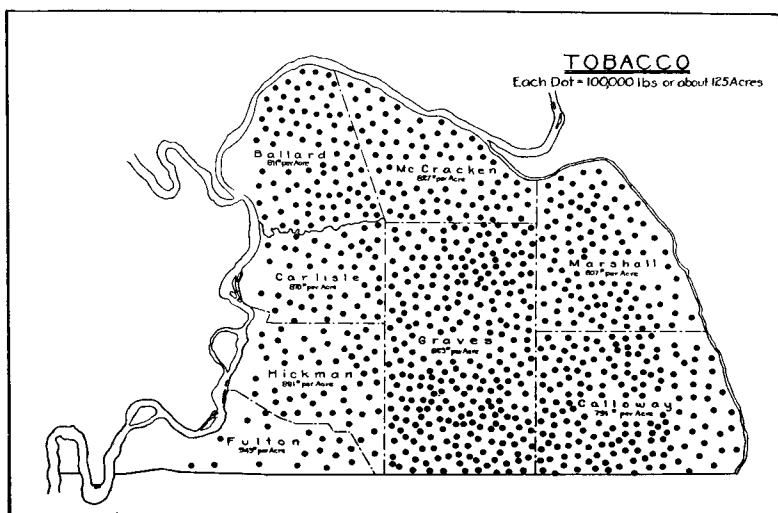


Fig. 22. Distribution of the tobacco crop in the Purchase.
(Data from 14th Census.)

The tobacco grown is the dark fired type or an export tobacco, the Purchase sometimes being referred to as the "Black Patch" because of the type of tobacco produced. Ballard County also grows a small amount of Burley, which is normally marketed and manufactured in Paducah. Estimates as to the amount exported vary from 80% to 90% of the total crop. France, Italy, Holland, Belgium and other Western European nations secure most of the crop, the first three of these nations maintaining purchasing agents in the district. Most of the small amount not exported is made into snuff or is used for cigar wrappers or manufactured locally into twist, smoking and plug.

The crop is marketed at Mayfield, Paducah, Murray, Fulton, La Center, Hazel and Benton, and smaller amounts are shipped from places where are no warehouses. Estimates by tobacco men place the amounts marketed at these various places in 1919 as follows: Mayfield, 31,000,000 pounds; Paducah, 20,000,000 pounds; Murray, 16,000,000 pounds; Fulton, 8,000,000 pounds; La Center, 2,000,000 pounds, and Hazel, 1,500,000 pounds. The actual and relative amounts marketed at these places vary from year to year, but the order of importance is unchanged, with Mayfield in the lead, followed by Paducah in second place. At Mayfield, much of the tobacco is sold at auction at the so-called "tobacco chute," as high as 200 loads a day being marketed at the height of the season. At the other purchasing centers, the crop is largely contracted for in advance.



Plate XLVI. A typical "tobacco barn" in Fulton.

The growing of tobacco has not been beneficial in those counties where grown most extensively. High prices for tobacco induced the growing of large acreages and inflated land values. The fall of prices for tobacco ruined many farmers and disastrous failures to complete payments on land purchased at the peak of high prices resulted.

Tobacco requires much hand labor. The preparation of the seed bed, setting out of the plants, cultivation, worming, topping and harvesting, and curing and marketing of the crop involve work almost every month in the year. If the patch is large,

men, women and children must work in the field at certain seasons. As a crop grown to utilize surplus time, it fits into the farm economy very well, but when grown as a major crop and as the only "cash crop," it is a curse to the farming community where so grown. The sections where tobacco growing is a major farm activity show this plainly in the appearance of the farms and the condition of the farming community. Tobacco exhausts the soil rapidly and leaves it in poor condition, so that eroded fields are common in the tobacco growing districts. These areas of abandoned fields, growing up in persimmon and sassafras, are one of the characteristics of the area where tobacco is an important crop. Because of the amount of labor involved in raising the crop and the necessity that the entire family work in the patch, the homes show the effect, as they always do where women and children work in the field. The future is certain to witness a change in the relative importance of tobacco as a crop and a decrease in the acreage grown.

MARKET GARDENING AND FRUIT RAISING

In truck gardening, McCracken County, with the Paducah market, leads by a wide margin. Sweet potatoes are becoming a rather important minor crop, being shipped in considerable quantities as well as consumed locally. The extent to which they are grown in a given county is largely a question of the effectiveness of the marketing organization. Of the 1919 crop of 129,-923 bushels, McCracken County raised 37.6%. Other garden products, especially tomatoes, are grown for the canning factories at Barlow, Wickliffe and Columbus.

Fruit growing offers opportunity for considerable expansion as the supply, even for the local markets, is mostly poor in quality as well as insufficient in amount. McCracken County leads with 160.4 bearing fruit trees and 217.8 bushels of fruit per square mile, production falling to 51.7 bearing trees and 43.9 bushels of fruit in Fulton County. Not only are the bearing trees few in number in the Purchase, but the fruit is often poor in quality as well, the trees frequently being "volunteers." On only a few farms are the orchards extensive, well kept and productive of high grade fruit. Many orchards are so located, espe-

cially in the hilly sections, that frost prevents the securing of anything more than an occasional crop. Improvement of conditions is occurring, but it is very slow. Expansion to care adequately for local needs at least is urgently needed.

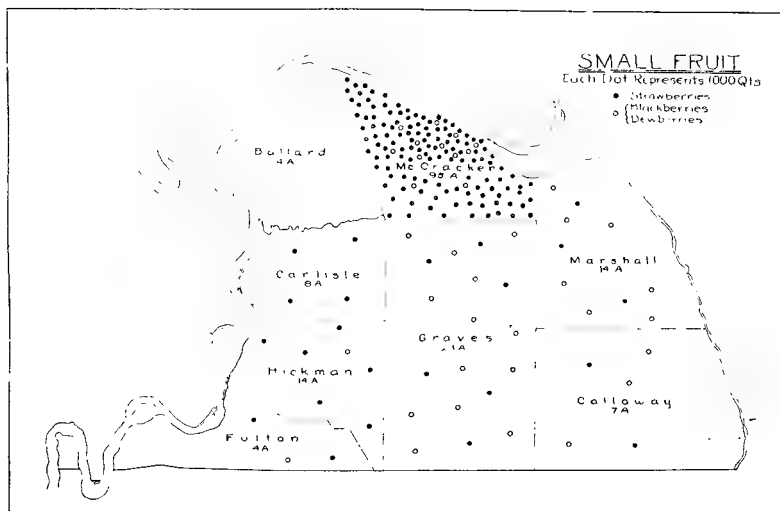


Fig. 23. Small fruit production in the Purchase.
(Data from 14th Census.)

McCracken County leads in small fruit production as well as in the production of orchard fruits, producing 82.4% of the total strawberry crop and 71% of the total small fruit crop in 1919. The position occupied by McCracken County in the growing of strawberries is not due to the soil or the climatic characteristics of the county, but is the result of a superior local market and a perfected organization for the marketing of berries not absorbed locally. The berries command a good price in northern markets as they ripen at a time to bridge the gap between northern and southern berries. The Paducah area enjoys the advantage of nearness to and direct communication with the Chicago market, which enables the Kentucky berries to meet competition successfully. In addition to the cultivated berries, production figures for which appear in census statistics, wild blackberries grow in great profusion along the "branches."

ANIMALS AND ANIMAL PRODUCTS

The Purchase ranks well by comparison with other portions of the state in the matter of animal industries, showing an average practically equal to the state average in cattle production

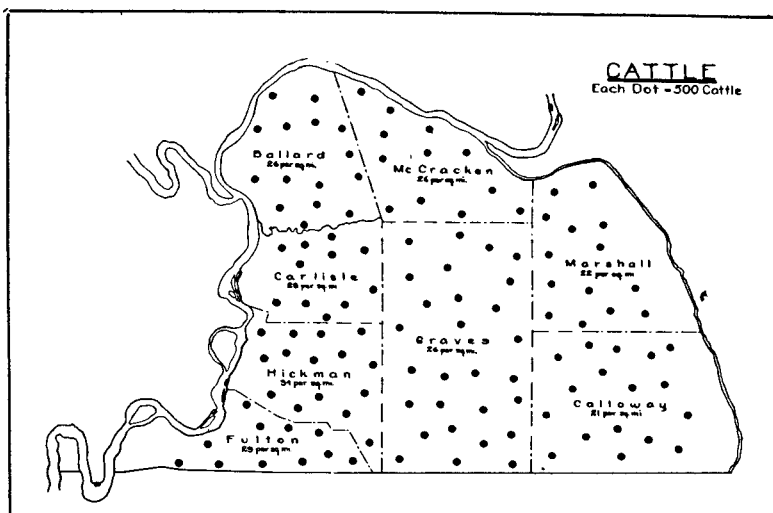


Fig. 24. Distribution of cattle in the Purchase.
(Data from 14th Census.)

and ranking far above the state average in the number of hogs per square mile. Each year since 1909 has witnessed a substantial increase in the number of cattle and the value of the dairy products.

Reference to Fig. 24 indicates the distribution of cattle. As would be expected, the areas of more diversified farming, Fulton, Hickman and Carlisle counties, show the greatest number per square mile. There is much need for more stock over large portions of the Purchase in order to help maintain soil fertility. There is also need of a more extensive dairy industry, as the supply of milk and cream for local needs is inadequate.

As corn is the principal cereal crop, hogs are bred in large numbers. The counties of normal maximum corn production, Fulton, Hickman, Carlisle and Ballard raise the greatest number of hogs per square mile, as shown graphically in Fig. 25. Coincident with the falling off of corn production, there occurred

a decrease in the number of hogs, the total decrease being 12,000 or 10% for the decade ending 1919. As long as corn remains the staple cereal crop, the raising of hogs may be expected to continue to be one of the major animal industries of the Purchase.

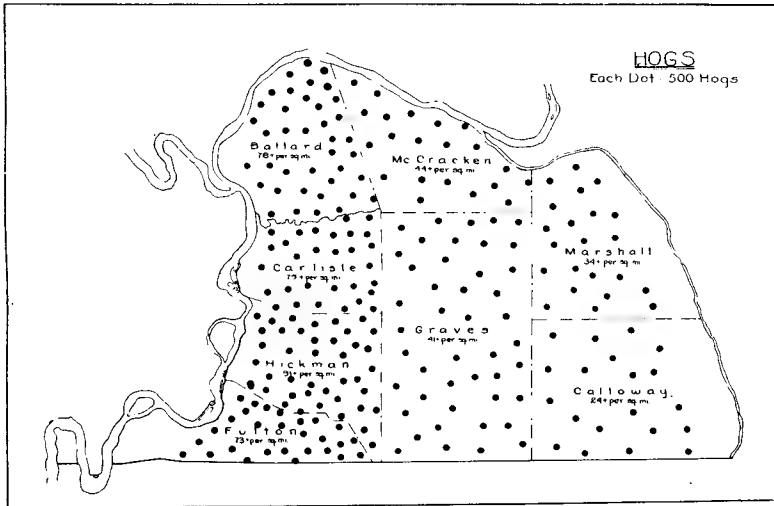


Fig. 25. Distribution of hogs in the Purchase.
(Data from 14th Census.)

Sheep are few in number, but goats are more numerous than in any other section of Kentucky, 22.6% of all the goats in the state being found west of the Tennessee River. Browsing as they do, they tend to keep down sprouts in fields not being cropped. They are able to pick up a living on poor pasturage and at the same time serve a useful purpose, hence they are increasing in numbers. Their distribution by counties is shown in Fig. 26.

A great deal of attention is being given to the improvement of poultry. This has resulted in a somewhat greater egg production, though there has been no increase in the number of the poultry. In McCracken and Hickman counties, the value of the poultry products rises to over \$300.00 per square mile. For the region as a whole, however, this is only a small fraction, about 1%, of the total value of the agricultural products. Conditions

for poultry raising are good, and on the small farms which now exist the revenue to be derived may easily make the farm show a profit rather than a loss.

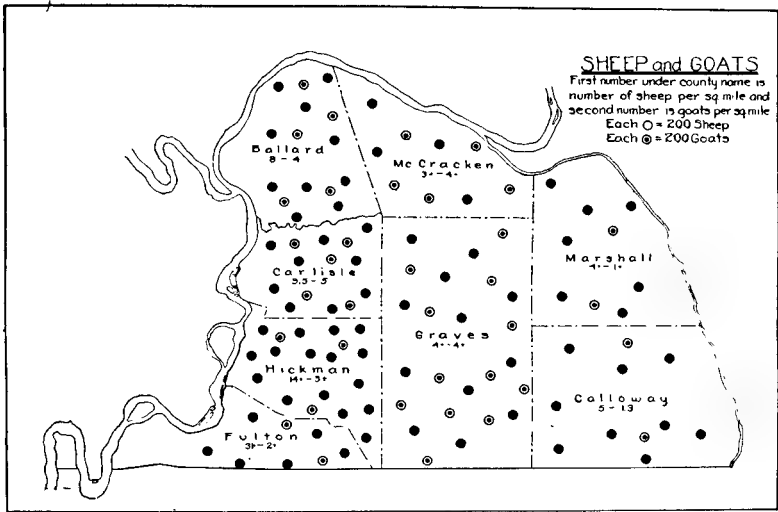


Fig. 26. Distribution of sheep and goats in the Purchase.
 (Data from 14th Census.)

Mules outnumber horses as draft animals. In the hills, both mules and horses are inferior, as little attention is paid to careful breeding. In the hill country, the average mule is below 1,000 pounds in weight. In the more level areas, there is a tendency to breed somewhat heavier stock. Mule swapping and horse trading lend a rather picturesque side to "Court Day" at a county seat in one of the hill counties. Both mules and horses are pressed into service under the saddle as the West Kentucky farmer seldom walks when he can ride.

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CHAPTER VII.

CONDITIONS OF LIFE IN THE RURAL DISTRICTS

Conditions of life are sharply contrasted in the different sections. In the Cane Hills region, the farms are prosperous and buildings are generally good. The same is also true to a lesser degree in the Barrens, the Flatwoods, and the Second Bottoms. In the Oak and Hickory Hills, in the Breaks of the Tennessee and on the Big Bottoms, very different conditions prevail.

Dwellings in the more prosperous regions are mostly well furnished, two-story frame dwellings, often with the double porch so characteristic of Kentucky architecture. Some are rather pretentious, as shown in Plate XXIX, others are merely good, substantial, well kept structures as shown in Plate XXXIX. They are quite commonly set well back from the road in a grove of fine shade trees as shown in Plate XLVII. The large, shaded yards and spacious porches are common because of the climate, which admits of much time being spent in the open.



Plate XLVII. A Fulton County farm house set in a spacious shaded yard. West of Jordan in Fulton County.

Elsewhere, in the hilly regions, many houses are built of roughly squared and fitted logs. Some of these are single room

Numbers in parentheses refer to the chapter bibliography at the end of the chapter.

cabins, as shown in Plate XLI, others have two rooms with a hall between and a long low porch across the front as shown in Plate XLVIII. Roofs of these log houses are commonly hand-split shingles. Where the houses are not constructed of logs, they



Plate XLVIII. A Marshall County log house with center hall and roof of hand split shingles.

are unpainted and unplastered one or two-room frame structures. All the houses in these poorer areas are scantily furnished. In Calloway County, the total assessed value of all buildings is only \$619.00, and in Marshall County, \$590.00 per farm. These are average values and far exceed the value of the buildings in the poorer portions of these two counties.

Outbuildings in the hills are not large, in many cases being only dilapidated sheds. Even in the more prosperous areas, where corn and tobacco are the principal crops, large barns are lacking. The tall tobacco barn, often constructed of logs, is a conspicuous feature, but the hay and grain barn of the northern farm is lacking. Crops are generally inadequately cared for. Hay is stacked in the field as shown in Plate XLIX and corn is easily kept in a small crib; outbuildings other than a few sheds are, under these conditions, unnecessary. In the southwestern counties, where more stock is kept, the barns are larger. Rail fences are still in use in the timbered upland (See Plate XXXV),

but the wire fence is the common type in the Barrens and the other originally treeless areas (See Plate XXXIII).



Plate XLIX. Hay stacks in northern Graves County. The stacks are secured by poles which prevent damage by wind.

For household use, water is obtained from wells or cisterns. The cisterns are constructed by plastering directly on the stiff



Plate L. A cistern in northern Graves County.

clay subsoil. The wells are commonly dug, though sometimes bored, and on the bottoms, where the distance to water is not

great, wells are frequently driven. Cisterns are in general use on the uplands, where the distance to water is great and wherever the water is poor in quality, as in the Flatwoods and Loess areas. Water is commonly drawn by hand or by means of a crude, home-made windlass.



Plate LI. A bored well with long cylindrical bucket for drawing the water. On the outskirts of Arlington.

Pumps are sometimes used, especially with the shallow-driven wells. The cisterns and wells serve not only as sources of drinking water, but as a place for keeping milk and butter as well.

Water for stock is supplied by springs along the valley sides, by the streams which flow during the entire year and by the pools which stand in the smaller creeks. On the rolling ridge land and on the upland, general dependence is placed upon artificial ponds which hold water in the clayey soils. Such a pond is shown in Plate XXXVIII. Where the Columbia loam is thin or lacking, as in the Breaks of the Tennessee, farmers, not having access to creeks, haul water for stock during the dry season.

Deficiencies in the supply of water for stock and an unsatisfactory supply for domestic uses are a survival of pioneer willingness to put up with inconveniences. Proper wells would insure an abundant supply of water.

Strong differences exist between the inhabitants of the hillier, more backward areas of the middle and eastern sections and those of the more level and productive lands. In the more unprogressive areas, illiteracy is common, both sexes go barefoot much of the year, families are large, and marriage occurs at an early age.



Plate LII. A "Public Speaking" near Mayfield, Graves County.

During political campaigns, the "public speaking" is the Mecca for the countryside. Crowds gather, day after day, to listen to the various candidates and exchange the news, as the speakings are distinctly social functions, aside from their political character. In few sections of the United States do the inhabitants possess such an interest in local civic affairs and in local elections.

Second only to a "speaking" is "court day" at the county seat. These days also serve as an opportunity for doing shopping. On such days, the melon vendors do a lively business from their stands at the corner of the courthouse square, for every town with such a square, has one corner sacred to the sale and consumption of the melons which are second to none in the country in quality. These gatherings on court days are indicative of a survival of the old customs which are rapidly disappearing in most of the counties. Such gatherings can be duplicated in few portions of the United States.

The small, cheap automobile has done much to lessen the isolation of the farms during good weather, and with the improvement of the roads, will do much more. R. F. D. routes reach all parts of the Purchase, so that the farmer is able to maintain contact with the outside world and to enlarge his wants through the perusal of the mail order catalog.



Plate LIII. A quiet day for the melon vendors at Mayfield.

The rural schools reflect the stage of development of the area. Schools are large, averaging over 40 pupils per school. The school year is only six months in length, so that the average pupil receives less than one hundred days schooling (3) a year. In most of the counties, schools are in session during July and August, though there is an increasing tendency to begin schools early in September. In McCracken and Ballard counties, this is already true for most of the schools. Summer sessions are necessary in some counties on account of the condition of the roads during the winter. The efficiency of the schools is greatly decreased by summer sessions, as the high temperatures make effective work difficult. The time of beginning and closing schools is also influenced by the crops grown. In the cotton growing districts of Fulton County, schools begin in July or August, but commonly close during the cotton picking season.

As most of the houses are without screens and as few precautions are taken to prevent malaria, it is extremely prevalent,

levying a toll the exact extent of which it is difficult to estimate. (1) Although more prevalent on the bottoms, the uplands also suffer severely. The lassitude and indolence, which are so marked in the inhabitants over large areas, are without doubt in large part directly traceable to the prevalence of malarial fevers. This is a condition which can and should be remedied. The cost of eliminating the breeding places of the mosquitoes by draining of the bottom land would be repaid by the increase in the value of the drained land. The substitution of wells or tightly covered, mosquito proof cisterns for the stock watering ponds would involve expense, but the gain resulting from the elimination of malaria, would offset the cost. If these measures were taken and the houses screened, the ravages of malaria would be much reduced, and on the uplands at least, it would gradually disappear.

OWNERSHIP OF THE LAND

There is locally a widespread popular belief that this is peculiarly an area where every farmer is a landowner, which is not warranted by the facts. In the poorer areas, where it is almost impossible to wring even a bare existence from the soil, even when the farm is owned, tenancy is usually absent. In the more fertile areas, however, tenancy exists and is increasing, because as land values ascend, it becomes more and more difficult for the man without much capital to acquire a farm, and what is perhaps even more important, less and less desirable for a man to purchase a farm which he can rent at interest rates below those he would be obliged to pay in case he borrowed the money to purchase the farm.

A consideration of the tabulated data will reveal the fact that tenancy has increased 60% in the past 20 years, and that in at least half of the counties, it has assumed serious proportions, this being particularly true in the counties where land values are high and where "cash crops" are important.

FARM TENANCY

Name of County	Number of Farms Worked by Tenants.			Percentage of All Farms Worked by Tenants	Assessed Value Per Acre
	1900	1910	1920		
McCracken	504	518	628	29.5%	\$72.29
Calloway	701	975	1392	32.4%	54.03
Carlisle	496	500	519	36.1%	61.79
Marshall	526	877	1265	37.7%	50.05
Graves	1397	1779	2488	40.9%	65.57
Ballard	683	983	873	44.1%	68.44
Hickman	892	1056	1180	45.8%	67.40
Fulton	438	625	686	56.9%	91.34
Totals	5,637	7,313	9,031		

Data from U. S. Census.

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CHAPTER VIII.

HIGHWAYS AND TRANSPORTATION

ROADS

Road maps are available in few of the counties and the information on road mileage available from the County Courts, which administer the roads, is meager. Estimates, based on the best information available, would indicate a total mileage of approximately 4,800 miles, or one mile of road for every five square miles of area. In addition to the public highways, there are many miles of private roads. Of the public highways, 1,000 miles is turnpike, of which at least 700 miles are in very poor condition. The remaining 3,800 miles of road are innocent of any improvement worthy of the name. Only in Ballard and McCracken counties are the main traveled highways good gravelled roads.



Plate LIV. A view of the Mayfield-Paducah road in McCracken County. One of the good roads of the Purchase.

In the Barrens, Flatwoods and other level areas, the roads form a fairly regular mesh and, except for the main traveled highways which run in nearly direct lines from town to town, generally follow section lines. This is shown in Fig. 11. In the hilly areas, this is not true. In such sections, topography is the determining factor in road location, the main roads following

Numbers in parentheses refer to the chapter bibliography at the end of the chapter.

the creeks, with branch roads, many of them private, leading back to the farms on the ridges. Houses are generally closely spaced along the roads, the typical condition being shown in Plate VI.

The majority of the roads are far too narrow, the sixteen feet between fences allowed by law being a common width; only the main traveled highways are as wide as thirty feet. In Ballard and McCracken counties, where the campaign for good roads has been most effective, the roads are wider, McCracken County having three roads sixty feet in width.



Plate LV. A road fenced in less than sixteen feet wide, in southern Graves County.

Where roads are so narrow, it is impossible to provide for a roadbed of fair width together with adequate drainage. Widening the roadways to provide for good drainage and a road on which vehicles can pass with safety, involves the purchase of land, as the farmers are generally opposed to wider roads which encroach upon their small areas of improved land. This renders road improvement expensive and tends to retard the development of an adequate road system. In the absence of a well drained roadbed, roads are frequently heavily crowned and deep gullies often flank the road on either or both sides and render travel dangerous.

Most of the roads are impassable with a load except during the summer and early fall months, which compels the marketing

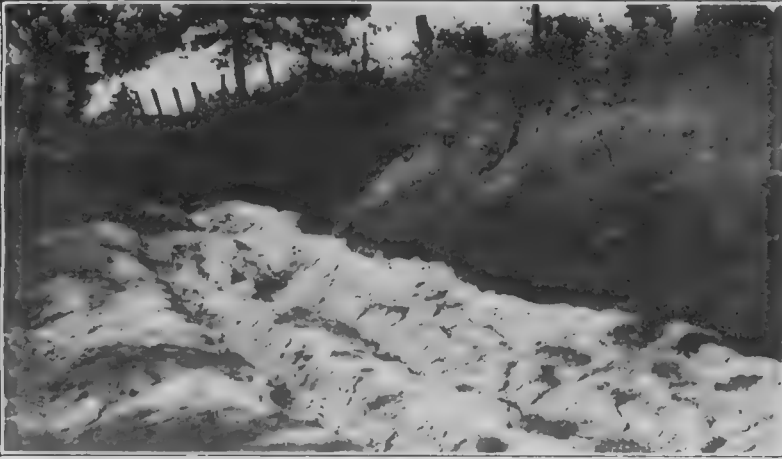


Plate LVI. A rutted clay road in southwestern Graves County. This is a characteristic occurrence on the side roads wherever the slopes are steep.

of crops during a limited portion of the year. This deprives the farmer of the opportunity of profiting by a distribution of



Plate LVII. "Rocky Lane," a road in southern Calloway County. The car is in the creek bed, the road is to the left.

his work and also prevents his taking advantage of the higher prices which may obtain when markets are cut off by road con-

ditions. Many roads run along bottoms or cross branches frequently, so that communication is difficult during and after rains. The numerous illustrations (Plates XXXIV, LV, LVI and LVII), which accompany the text and which do not represent exceptional conditions, testify to the pressing need of better roads.

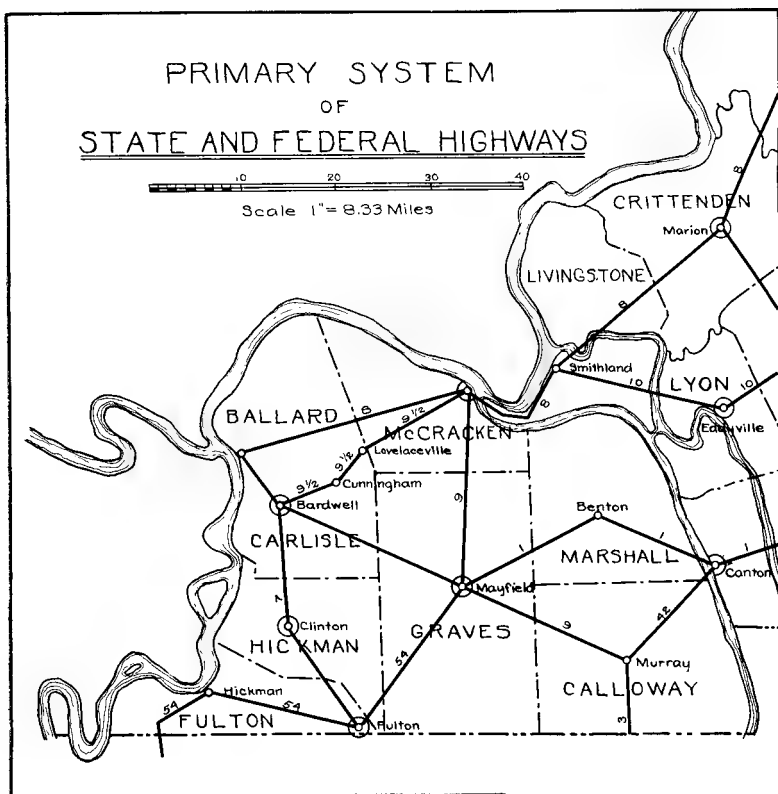


Fig. 27. The projected state system of primary highways in western Kentucky.

The movement for better roads in this area, as elsewhere, originates in the larger centers of population. In the more isolated sections, the conservatism of the rural population impedes progress in the construction of good roads. McCracken and Ballard counties already have many miles of fine gravelled high-

ways, all of which link up with portions of the state system of primary highways. In most of the counties, good gravel is close to the surface; in no county is it necessary to haul road building material long distances so that the cost of construction would be excessive.

RIVER NAVIGATION AND FERRIES

RIVER NAVIGATION

Two companies operate packet lines on the Ohio, Tennessee and Cumberland rivers. The St. Louis & Tennessee River Packet Company own six boats, only three of which were in operation during the summer of 1921. Of the three boats operated, two ran from Paducah up the Tennessee River as far as Shiloh and Florence, Alabama. The Nashville Navigation Company operated two packets out of Paducah, one to Evansville on the Ohio, the other to Nashville, Tennessee, on the Cumberland River. In addition to the two companies, three independent packets were also in operation, two on the Ohio and one on the Tennessee River.



Plate LVIII. Two of the packets of the St. Louis and Tennessee River Company tied up at Paducah.

Operating on the Tennessee are seventeen towboats, stern wheelers which can tow from four to forty standard barges, 26 feet wide, 135 feet long and 8 feet deep. Both ties and coal

are carried by these barges. The coal is mined in the West Kentucky Coal Fields and the ties are cut at various points along the Tennessee River, where small amounts of timber still remain. Much of the coal goes to Paducah; the ties are largely unloaded at Brookport, Metropolis and Joppa. The building of barges for the towing trade is a rather important industry at Paducah.

In addition to the packets and towboats, between thirty and fifty small, stern wheel gasoline launches run out of Paducah, the number varying with the season and the amount of freight available. These smaller boats play havoc with the business of the packets as their rates are less, and though in many cases not under responsible management and not affording regular service, they secure enough of the business to make it difficult to operate the regular lines at a profit.



Plate LIX. Wharf boat at Paducah with two packets moored alongside.

The season of greatest activity in river navigation is at high water stages; during the summer, the boats operate with only partial cargoes because of the shallow water in the rivers. The packet lines serve a considerable district not adequately reached by railroads. The area between the Cumberland and Tennessee rivers, except in its northern portion, is not accessible by rail. In addition, the areas immediately to the west of the Tennessee and to the east of the Cumberland are much more easily reached by river than by rail. These are the areas served

by the packet lines which focus on Paducah, which is located at the junction of the Ohio and Tennessee rivers and only a short distance downstream from the place where the Cumberland flows into the Ohio. The packets carry general merchandise such as groceries, hardware and agricultural implements to the farming areas with return cargoes of grain, tobacco and livestock. River navigation has been of declining importance for many years. Some of the river boats have been converted into floating theaters. These boats travel up and down the different rivers, playing at the various river towns, many of which are not readily accessible to most amusement enterprises.



Plate LX. Eggner's Ferry on the Tennessee River at Aurora.

Although packet lines still survive on the smaller rivers and Paducah still enjoys a considerable advantage from its location at the junction of the Tennessee and Ohio rivers, all boat lines have vanished from the Mississippi River. An occasional cargo may be picked up at Hickman or some other river town, but there are no regular packet lines such as those operating out of Paducah. The Federal Barge Line Boats, which operate on the Mississippi, do not stop at any of the river towns in the Purchase.

The wide fluctuation in volume of the Ohio River at Paducah necessitates a floating dock which rises and falls with changing

river levels. As the river rises, it is moved shoreward up the stone paved slope. At high water stages, it is in position at the very summit of the slope. This wharfboat is used by all the regular packet lines, freight being received and discharged there by all boats which touch at Paducah.



Plate LXI. The arrival of the ferry at Wickliffe.

FERRIES

Because of their width and the great fluctuation in volume of the three great rivers which bound the Purchase, and the consequent expense of bridge construction, there are no wagon bridges across the Tennessee, Ohio and Mississippi rivers, freight and passengers being transported by ferry. The location of the principal ferries is shown in Fig. 2. Typical ferries are shown in Plates LX and LXI. The Tennessee River ferries are all similar in type to Eggner's, as the traffic is not heavy, but the ferry across the Ohio at Paducah is similar to the one at Wickliffe. The rapidly increasing automobile travel on main highways renders some of these ferries sources of considerable profit to their operators.

RAILROADS

Railroads have not been very significant in the development of the Purchase and they are not today an important determining factor in the activities of the area except for Paducah, and

to a much lesser extent for Mayfield and Fulton. The area was occupied and its economic system established with rivers as the means of communication. The building of railroads has not resulted in any appreciable rural readjustment.

Railroad construction did not begin until 1851 and did not attain large proportions until about 1860. (See Fig. 28.) By that time, the Purchase had a density of population of approximately 25 per square mile. (See Fig. 31.) Subsequent increase in population has not been the result of an influx from outside, but represents merely the natural increase.

For the rural sections, main north and south lines of rail communication, as well as east and west connections with Louisville and St. Louis, are not of great importance in explaining present conditions. Agricultural practice in the area is not greatly influenced by ease of transportation. The principal crops, corn and tobacco, represent the bulk of the agricultural production. Most of the corn is consumed locally; the tobacco is of the export type, of peculiar quality and high value, consequently freight rates and the relation of local lines to through communication determine neither the area planted to tobacco nor the price which it commands.

Conditions are not static, however, as the industrialization which has begun at Paducah, is spreading because of the very advantageous position which the Purchase occupies on the railroad network of the United States. It is, therefore, proposed to treat, briefly, the location and reasons for early construction, later railroad building and consolidation, the present condition, and the outlook for the future.

Rail construction* in the Purchase began about the time river navigation reached its period of maximum importance, railroads at first serving only as feeders for the river highways. Construction in all cases began from river termini, the lines extending into territory not directly accessible to the rivers. (See Fig. 28, 1851-1860.) The decline in importance of river navigation witnessed the passing of the importance of river termini. Of the towns which early served as river railheads, Columbus is

*Statements regarding dates of construction and operation are on the authority of officials of the railroads concerned. Poor's Manual of Railroads for 1922 and prior years is authority for the relationship and ownership of the component parts of the various systems.

now on a spur line and Hickman is of declining and minor importance; Paducah alone has succeeded in holding an important place as a railroad center.

The first railroad in the Purchase was the Nashville & Northwestern line from Nashville, Tennessee, on the Cumberland River, to Hickman, Kentucky, on the Mississippi River. This road furnished an outlet to rivers, both east and west. Like many other railroads constructed at an early date, it was given the financial backing of the state, Tennessee indorsing the bonds, later foreclosing when the interest was not paid. After being operated for a short period by the state, the road was sold to the Nashville & Chattanooga Railroad, the name of which was changed to the Nashville, Chattanooga & St. Louis Railroad in 1873 after the formal consolidation of the lines. Today, this is the main line of the Nashville, Chattanooga & St. Louis Railroad.

In 1854, the New Orleans & Ohio Railroad began construction south from Paducah. Like the preceding construction, it afforded an outlet to a river highway. Following several changes in ownership, the line, which extended from Paducah to Fulton when completed, was leased by the Illinois Central Railroad, by whom it is operated at present.

The third of the early railroads, which functioned to supplement the river highways, was the line of the Mobile & Ohio Railroad from Columbus to Mobile. Construction on this line was begun from Mobile northward about 1851 and from Columbus south about 1856, the line being completed to the Tennessee line in 1857. In both cases, construction afforded an outlet by water for traffic which originated at some distance from navigable streams.

The three preceding lines comprised all the construction in the Purchase prior to the Civil War. During the war, no new lines were added to those already in existence, but subsequently, a new period of construction began. (See Fig. 28.) This construction was of a different type, however, from the early railroad building. It was an attempt to connect existing transportation links by new construction in order to provide continuous railways between North and South. The beginning of this construction was coincident with the decline in importance of river navigation.

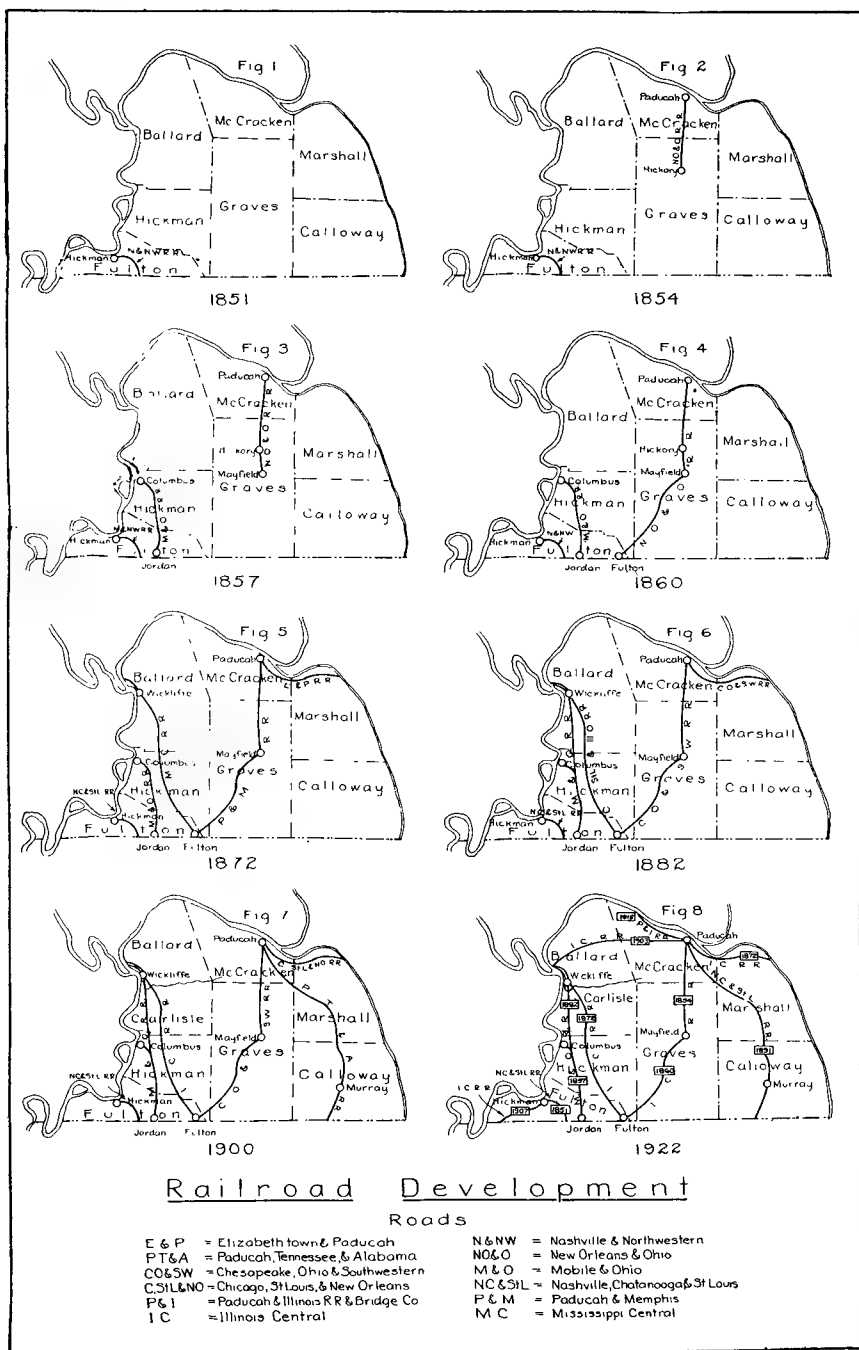


Fig. 28. Development of the railroads of the Purchase. Dates of construction and some of the changes in ownership of the lines are indicated.

At the close of the later period of construction and consolidation, most of the lines in the Purchase were embraced in three systems: the Illinois Central, the Mobile & Ohio, and the Nashville, Chattanooga & St. Louis. In addition, a short line, 13.5 miles in length, built jointly by the Chicago, Burlington & Quincy and the Nashville, Chattanooga & St. Louis, and used by the Illinois Central as well, connects Paducah with the bridge across the Ohio River at Metropolis.* The total mileage for the Purchase is 246.773 miles, or slightly over one mile of railroad for every 10 square miles of territory. This is a trifle less than the state average for Missouri and about 50% of the state average for Illinois, which is extremely well served by railroad lines.

RAILROAD MILEAGE IN THE PURCHASE BY COUNTIES.

Counties	I. C. R. R.	N. C. and St. Louis	St. Louis, I. Mt. and Southern	P. and I.	M. and O.	Total	Sq. Miles of Area Per Mile of Railroad.
Ballard	7.50				4.43	11.93	21.1
Calloway		17.97				17.97	22.9
Carlisle	12.27				10.576	22.846	8.6
Fulton	21.88	10.52			6.635	38.035	5.0
Graves	30.67	.49				31.16	17.6
Hickman	17.16		1.18		17.052	35.392	6.3
McCracken	33.97	12.78		13.5		60.25	3.9
Marshall	12.20	17.99				30.19	10.8
Totals	134.65	59.75	1.18	13.5	38.693	247.773	9.6

The total mileage of each system by counties is shown in the accompanying tabulation. As will be noted, the mileage is very unequally distributed among the different counties. The Mississippi and Ohio River counties are the best served, with nearly

*The St. Louis, Iron Mt. and Southern Railroad, a portion of the Missouri Pacific Railroad, also has 1.18 miles of track in Hickman county.

two thirds of the total mileage, though less than half the area. This is in large degree due to the fact that they were the counties in which the greatest amount of early railroad construction occurred, so that in the later period of railroad building, most of the additions to connect up the links and complete the roads as they exist today were made in the counties along the rivers. There are no serious topographic obstacles to railroad construction in any portion of the area.

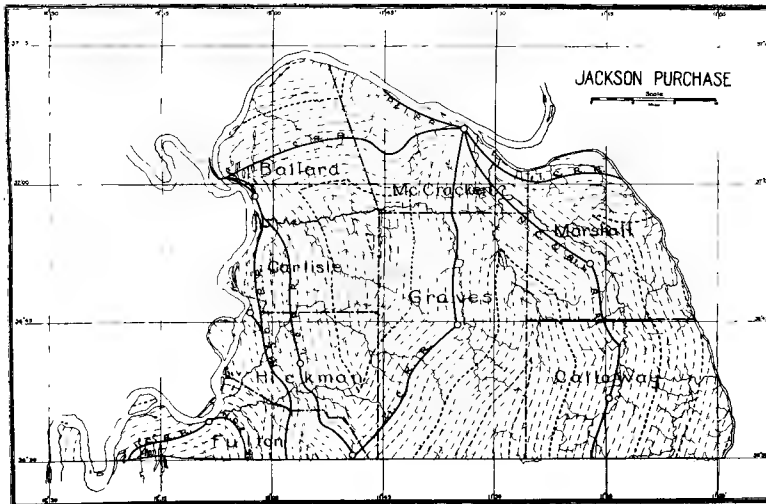


Fig. 29. Air line distances from railroads.

The Illinois Central lines, which embrace 54% of the mileage in the Purchase, are all operated under lease from the Chicago, St. Louis & New Orleans Railroad Company, with the exception of the short line from Hickman, Kentucky, to Dyersburg, Tennessee, the stock of which was acquired in 1913 by the Illinois Central Railroad. The Purchase is on the most direct line of communication between Chicago and New Orleans, hence the location of the Illinois Central lines. Although Paducah is to one side of the main line, it has good connections with it at Wickliffe and Fulton. The Illinois Central also enters Paducah from the north over the tracks of the Paducah & Illinois Railroad & Bridge Company. This makes Paducah one of the great gate-

ways to the South. The Illinois Central also taps the state of Ohio by means of lines running eastward through this region.

The lines of the Nashville, Chattanooga & St. Louis Railroad, which is controlled by the Louisville & Nashville through ownership of capital stock, afford an outlet to the south and southeast into Tennessee, Alabama and Georgia. The line into Paducah, together with the bridge across the Ohio at Metropolis, furnishes an outlet to the north over one of the most direct routes to the Chicago area, again placing Paducah on a great north and south line.

The Mobile & Ohio Railroad, which is controlled by the Southern Railway Company, completed its outlet to the north in 1872, when it extended its lines from Columbus to East Cairo, and thence built into St. Louis. In this wise, the old local railheads were abandoned for connections with major traffic terminals of national importance. The Mobile & Ohio was forced to enter St. Louis and almost disregard Columbus or fail. It was the same with the other local termini.

The Purchase is located astride three direct lines from the North to the Gulf. To the north, the lines of the Illinois Central and the Nashville, Chattanooga & St. Louis unite the area with Chicago; the Mobile & Ohio ties up St. Louis with the Purchase; the Chicago, Burlington & Quincy furnishes an outlet to the north and affords connections with the northwest. To the east, the Illinois Central affords communication with Louisville. There is no equal area immediately south of the Ohio River through which so many important north and south lines of railroad pass. Such a location on main railroad highways affords the Purchase an opportunity which may give increasing industrial values to its larger centers of population.

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CHAPTER IX.

CITIES AND MANUFACTURES

In the establishment of the earlier county seats, a central location was always selected. Mayfield, Wadesboro, Murray and Benton are county seats which were so located. In the case of county seats, this central location was with respect to an entire county, but in the case of most of the smaller towns, the location selected was central for a smaller area. Topographic conditions did not restrict the multiplication of centers. Poor means of communication, i. e., muddy and rutted roads, necessitated the formation of a large number of such centers, so that today there are an extraordinary number of small towns and crossroads stores, upward of 165 in number for the entire area, or an average of one center for each fourteen square miles, which means a small town or store every three and one-half to four miles.

The greater number of these small places are in the south-east portion, which is most poorly served by railroads, and where the country is excessively hilly and the roads poor. In the counties with better roads, and in the counties where railroads were constructed at an early date (See Fig. 28), country stores and small towns are more widely spaced. In the small towns, population is nearly stationary or declining as the necessity for their existence has disappeared. As time passes and methods of communication improve, a steady decline in number and decrease in importance of these smaller centers may be expected, together with an increase in the concentration of population in the towns, which because of a strategic location on the crossroads of major highways of travel, possess a central location for larger areas.

Towns are built on no definite plan, except where centered around the courthouse square. When the town was in existence before it became the county seat, the courthouse does not occupy a central location, but is situated at some distance from the business center. Examples of this are afforded by Paducah, Bardwell and Hickman. When the town was platted as the county seat, the business blocks are centered around the courthouse square as

Numbers in parentheses refer to the chapter bibliography at the end of the chapter.

at Murray, Benton, Mayfield, Clinton and Wickliffe. As long as the population is small, this arrangement of the business section offers no great disadvantage, but in a larger place, it would be somewhat of a handicap. Paducah is fortunate in having the courthouse removed some distance from the business center.



Plate LXII. Brewer's, a typical crossroads center in Marshall County.

At different periods, various locations have possessed advantages which gave prominence to towns now of minor importance. At an early date, a location on the Ohio or Mississippi, which were the great highways of travel, was a valuable asset. Hickman, founded in 1819 as a river port, and for some time the terminus of one of the few railroads in the area (See Fig. 28), was for many years a place of major importance. It is today a thriving small town, the center of a fertile agricultural district, but though still the fourth city in size in the Purchase, its relative importance has diminished greatly as the value of its location has altered with improved methods of transportation. Formerly it was on a main highway of travel, the Mississippi River, with much trade diverted to it from a considerable area, in both Kentucky and Tennessee, by the railroad of which it was the terminus. Today, with the passing of the importance of river trade, the main highway between north and south lies

twenty-five miles to the west, and on this artery of trade, Fulton has sprung up as a rival. Similarly, Columbus, founded in 1818, reached its maximum importance about 1860, being the northern terminus of the Mobile & Ohio Railroad, as well as an important river port. Today the population is less than one-third what it was at the period of maximum prosperity, and in relative importance, it has declined even more largely.



Plate LXIII. View from the bluffs by the court house at Hickman. Overlooking the business section and looking up the Mississippi River.

The river towns, which were the only centers of early importance in the Purchase, are located where the Mississippi and Ohio flood plains narrow. These locations where the river swings against the upland afford good landing places. The residence sections of Hickman, Wickliffe and a portion of Columbus are situated on the river bluffs, out of flood danger (See Plate LXIII), but topographic conditions compel the location of the business sections on the flood plains. This renders them subject to flood and the attack of the river, for wherever the flood plain narrows and the river swings toward the bluffs, the meandering of the stream tends steadily to destroy the portion of the town site on the flood plain. Much of the former site of Columbus is occupied by the present river bottom through this action. Cairo, in southern Illinois at the junction of the Ohio and Mississippi rivers (See Fig. 2), is built entirely on river

flood plain so that no portion is free from flood danger and the site is continually subjected to the attack of two great meandering rivers. Of all the river towns, Paducah, which is built on a river terrace, is the only one practically free from flood damage. Only in very limited sections is there any danger from flood, and these are not the business and manufacturing areas, but some of the poorer residence districts. The river terrace allows for an almost indefinite expansion of the city on level land free from danger of overflow. (See Fig. 13.)

The sites of Hickman, Columbus and Wickliffe offer no special advantages aside from the fact that the flood plains narrow at those points. The creeks which enter the Mississippi River at or near Hickman and Wickliffe are not navigable. Cairo, at the mouth of the Ohio, has a much better location with reference to river highways. This has been of much more importance in the past than it is at present, as few packet lines operate on the larger rivers. Paducah, however, still profits from its location at the junction of the Tennessee and Ohio rivers and benefits as well from the fact that the Cumberland River joins the Ohio only twelve miles upstream (See Fig. 2), for packets still carry considerable freight on both the Tennessee and Cumberland rivers, and Paducah controls the trade.

Paducah is one of the major foci for the projected primary system of State and Federal Highways in the Purchase (See Fig. 27). In the vicinity of Paducah, the system is completed, excellent gravel highways leading out of Paducah in all directions to the various portions of McCracken, Ballard and Marshall counties. (See Plate LIV.)

As early railroad construction was largely for the purpose of feeding river lines, the various river towns fared about equally well during the initial period of railroad construction. (See Fig. 28.) Later construction, which involved the linking of existing transportation lines, benefited the towns along the Mississippi River, including Cairo, as much if not more than it did Paducah. The superior location of Paducah, however, finally brought about the construction of the lines (See Fig. 28), which today make Paducah the principal focus for the railroad lines which enter the Purchase. (See Fig. 2.)

Of all the cities in the Purchase, Paducah possesses the best location. Topographically, the site of the city is excellent. There is plenty of level land, free from flood danger, for the expansion of business and manufacturing sections. Paducah is located at a junction of functioning water highways and at a focus for land highways, both roads and railroads. Because of its superior natural advantages, it has become the largest city in the Purchase and the fifth city in Kentucky, with a population of 24,735 in 1920.

Because of its location, Paducah is the leading distributing center west of the Tennessee River. Merchandise enters at Paducah and is distributed from there by river packet (2), rail and truck to the smaller towns. Paducah possesses a total of sixteen wholesale houses, occupying a dominating position as a distributing center for manufactured products.

In addition to serving as a distributing center, Paducah enjoys an extensive retail trade, serving approximately 65,000 people in McCracken and adjoining counties. Due to the extent of the area tributary to Paducah, the retail stores are much better than would be expected in a city of its size, the stores comparing favorably with those of northern cities twice the size of Paducah.

For manufactures, many raw materials as clay, sand, hard and softwood lumber, tobacco, cotton, zinc and spar are available within short distances, and coal, easily accessible both by rail and water, assures cheap fuel. The manufacturing plants at Paducah are arranged in classes with the normal number of employes in the accompanying tabulation.

MANUFACTURES IN PADUCAH AND DISTRIBUTION OF EMPLOYEES.

	Men employed	Women employed	Total employees
Railroad shops	1200		1200
Woodworking establishments	780		780
Shipyards	240		240
Tobacco rehandling	700		700
Tobacco manufacture	65	65	130
Cigar manufacture	28	247	275
Brick and tile	260		260
Pottery	120		120
Hosiery	37	333	370
Clothing		130	130
Cotton mills	110	110	220
Shoes	289	96	385
Foundries	90		90
Totals	3919	981	4900

All data for Paducah as to manufactures and business are on the authority of the Secretary of the Paducah Board of Trade.

Men comprise 80% of the employees, and of the men, over 50% are employed in railroad shops or in the tobacco industry. The remainder are mostly employed in the woodworking or the clay industries. In cotton, clothing and cigar manufactures, women figure more largely, as is usual. The shoe, hosiery, clothing and cigar factories have all come in within the past five years and are indicative of the growing absorption of female labor into industry in this section.

Present industrial development centers around the facts that Paducah is an excellent distributing point, that certain raw materials are available and that an abundant supply of labor, capable of manufacturing the products from the raw

materials, is to be had. Further expansion of manufactures along lines similar to those already established may be expected.

The growth of Paducah has not been spectacular during any decade of its history, but it has been steady and substantial. In 1850, the population was 2,428, and by ten-year intervals thereafter, 4,590, 6,866, 8,036, 12,797, 19,729, 22,760 and 24,735 in 1920. (1)



Plate LXIV. Coal barges in the "Tennessee chute" at Paducah.

Paducah is a modern city, with a fine business section (2), well paved streets, a beautiful residence portion and excellent municipal improvements. Its location will always insure to it an important position as a distributing center and its accessibility to certain raw materials gives it an advantage in certain types of manufacture. The possession of advantageous freight rates and lines of water communication, together with the nearness to southern markets, should enable a considerable industrial expansion.

Mayfield, the second city in size in the Purchase, was named as the county seat when the county was formed in 1821. When the town was platted in 1822, a public square was reserved in the center of the town, where the courthouse now stands. As the county seat and trade center of Graves County, with an area of 550 square miles, Mayfield is a minor distributing center and

enjoys a good retail trade. It is also an important tobacco market, ranking ahead of Paducah in that respect. Aside from the tobacco rehandling business, the only other industries employing any considerable number of hands are the Mayfield Woolen Mills and the Merit Pants Factory, the employes of both of these concerns being largely women.

Primarily, Mayfield is dependent upon the agricultural community for its existence. It serves as a market for the produce of the farms and as a place where farmers may make necessary purchases and satisfy their wants which cannot be met by the stores of the crossroads or the smaller towns. Mayfield has enjoyed a steady growth from 556 in 1860 to its present population of 6,583. The period of growth dates from the construction of the railroad (See Fig. 28). Mayfield is markedly different from Paducah, which is distinctly a modern city, whereas the atmosphere of Mayfield is that of the "Old South."

Fulton, with a population of 3,415, ranks next to Mayfield in size. It is primarily a railroad town, being a junction point on the Illinois Central Railroad system, coming into existence with the railroads about 1870. The growth of population, which the past decade has witnessed, has been largely the result of an increase in the number of railroad employes who work in the shops and offices and live in Fulton, supplemented by a certain amount of movement from the farms. Fulton is also the center of a good agricultural area and functions much as does Mayfield, except that the area is smaller. The city is located on the Tennessee line, part of the town being located in Tennessee. About two-thirds of the people and four-fifths of the taxable wealth are on the Kentucky side of the line. This division of the town by the state line is unfortunate, as it entails two sets of officials for what is essentially one municipality. Like most railroad towns, Fulton has an air of activity distinctly different from that of the average country town of similar size.

The cities of larger size are all spaced at intervals of about twenty-five miles, because where the chief dependence of the town is upon the country and the per capita purchasing power is not high, it requires that much area to support the retail establishments and populations of these larger centers. About

twenty-five miles to the east of Fulton is Murray, fifth in size in the area, with a population of 2,415. Like Mayfield, Murray, which was platted as the county seat in 1842, is built around the courthouse square. Aside from the tobacco rehandling business and some small tobacco manufacture, there are no factories, the dependence of the town being upon the country trade.

Although Hickman and Wickliffe are both county seats, they are dependent in major part for their prosperity upon the fact that they serve as centers for agricultural areas. Manufactures at these places are limited to small canning plants, mills, brick plants, potteries and industries of similar character, most of which are small and have a rather precarious existence.

The smaller towns as Arlington, Bardwell, Barlow, Benton, Kevil and La Center, with populations of between 500 and 900, owe their importance to the fact that they are located on a railroad at distances ranging from 8 to 18 miles from one of the larger towns and in the centers of good farming areas. In addition, Bardwell and Benton are county seats and owe a portion of their importance to that fact. Industrial development in these smaller places is negligible.

Changing conditions are indicated by the tendency to modernize the cities by pavements, street lights, gas, sewer systems, water systems, modern ice plants, and improved schools and school buildings. As indicative of this trend, the change in the source of water for domestic use at Mayfield may be taken as an example. Water is now obtained from wells 160 and 300 feet in depth, which draw upon the orange sands of the Lafayette and the light colored sands of the La Grange. Prior to the construction of these wells, cisterns were in common use. These Mayfield wells are typical of the wells from which Wickliffe, Bardwell, Clinton, Murray and other towns derive their water supply for household use. They are a great improvement over the earlier source of supply from cisterns and shallow wells. Similar changes are occurring in all the other phases of municipal improvement.

The Purchase is dominantly an agricultural area at the present time. Industrialization of the area has as yet made little progress, and except in the case of Paducah, is responsible in only a small degree for urban development and city growth.

The continually expanding population, the accessibility to certain types of raw materials and the nearness to markets, warrants the belief that further expansion, along the lines in which some progress has already been made, may be expected.

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CHAPTER X.

CLAY MINING AND THE CLAY INDUSTRIES

CLAY MINING

Pottery clays occur over the major portion of the Purchase as lenses in the Ripley and La Grange formations (1), but mining is restricted to limited portions where the lenses are thick, the clays of high quality, and the deposit is near a railroad line. The principal areas where clay is mined on a commercial scale are in Graves County north of Mayfield, in a narrow belt west of the I. C. R. R., near Pryorsburg south of Mayfield, and in the vicinity of Wickliffe in Ballard County. At numerous other places, pits are worked occasionally, small amounts being shipped when the demand is good and prices are high, but the

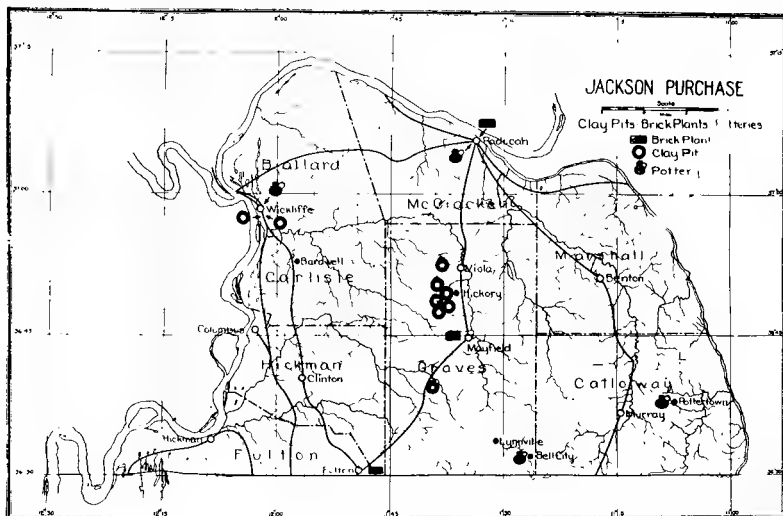


Fig. 30. Map showing the location of the clay pits, brick plants and potteries in the Purchase.

three areas named are the only consistent producers and shippers on any considerable scale. The principal areas of production are indicated in Fig. 30. In addition to the pits which

The managers, operators or owners of the clay pits, brick plants and potteries are authority for all current production data in this chapter. Numbers in parentheses refer to the chapter bibliography at the end of the chapter.

produce clay for shipment, some of the small potteries and brick plants operate pits to supply their limited needs.

The companies which operated north of Mayfield during 1920 and 1921 were the Old Hickory Clay & Tile Company, the M. B. Cooley Company, the Kentucky Clay Mining Company, the Old Colonial Clay Company, the West Kentucky Clay Company, and the Excelsior Ball & Clay Company. They are all relatively close together, their location being shown in Fig. 30. Near Pryorsburg, at Clay Switch, there is but one pit, owned and operated by the Kentucky Construction & Improvement Company. On the outskirts of Wickliffe the American Clay Company and the pit owned and operated by M. T. White have been in production during the past two years.



Plate LXV. Stripping by steam shovel in the Pryorsburg clay pit.

The character of the mining operations varies greatly. The pit at Clay Switch near Pryorsburg is operated on the most extensive scale and has the most complete equipment. Stripping is done by steam shovel as shown in Plate LXV; the clay is hauled by small cars and dumped directly into railroad cars on a private siding. If the pit were worked to capacity, the output would amount to 28,000 tons per year. At the other extreme of production and equipment are such small pits as that operated by the Excelsior Ball & Clay Company, without

CLAY PRODUCTION 1919-1921

COMPANY	1919 Pro- duction	1920 Pro- duction	1921 Pro- duction to Aug. 1	Thickness of clay	Thickness of overburden	Equipment of pit
Ky. Const. and Imp. Co.	13,506T.	23,033T.	8000T	35-40 ft.	15-40 ft.	Modern and good
Old Hick. Clay and Tile Co.	6,000T.	8,000T.	3500T	36-40 ft.	5-23 ft.	Good
M. B. Cooley Co.	Not opened		1000T	63 ft.	16-18 ft.	Good
Ky. Clay Mining Co.	Not opened	3,000T.	1050T	18 ft.	12-15 ft.	Good
Colonial Clay Co.	Data not available		100T		10 ft.	None
W. Ky. Clay Co.	Data not available		100T		16 ft.	None
Excelsior Ball and Clay Co.	600T.	500T.	200T	16-18 ft.	16-20 ft.	None
Am. Clay Co.	Data not available		500T estimated		8-40 ft.	Good
M. T. White	2,000T.	1,500T.	400T		6-8 ft.	None

buildings or equipment of any kind, where the clay is blasted, passed up to the surface by hand, loaded into wagons and hauled approximately two miles to Hickory over roads which necessitate the use of two teams on the hills.

Both ball and saggar clays are produced by most of the pits, the stratum of saggar clay usually being thicker than that of the more valuable ball clay. Production figures for the larger pits are fairly accurate, but for some of the smaller pits are only approximations from the best information available. The effect of this inaccuracy on the totals is negligible, as the small pits produce only a small fraction of the total output.

The total output in 1920, which was the year of maximum production, was not far from 38,000 tons, of which over 60% came from the Pryorsburg pit. This was more than the total production of the entire area in 1921. In general, the pits are worked ineffectively, as they are small and are not worked to capacity, which renders it unprofitable to install machinery for the economical handling of the clay. The pits are not worked steadily, even during the summer when weather conditions admit, consequently expense is involved in removing the material which shumps during periods of idleness. Even the more favorably located pits, which have only a short haul by wagon, are badly handicapped, as the estimated cost of hauling by wagon is 40 cents per ton for a one-mile haul.

Of the clays mined by the Kentucky Construction & Improvement Company, 60% go to East Liverpool, Zanesville, and other Ohio points; 15% to Pittsburgh, Beaver Falls and other Pennsylvania towns; about 10% to Indiana, 10% to West Virginia, and 5% to Michigan and New York State. Clays mined in the pits north of Mayfield go to the same general markets as those from Clay Switch. The clays from Wickliffe, which are highly refractory, are marketed elsewhere. The American Clay Company ships to Muncie, Indiana, and the clay produced by the M. T. White pit, is all marketed in St. Louis, being taken by the La Clede, Christy Clay Products Company.

The clays are used for a great variety of purposes, among them being the manufacture of wall and floor tile, electrical porcelains, terra cotta, sanitary ware such as bathtubs, general

ware as dishes, semi-porcelains, chemical porcelain, stoneware, steel enamel, binder for carborundum wheels, crucibles, glass melting pots, and a long list of minor uses.

An immense supply of clay is available, widely distributed and easily accessible, the amount of overburden being small, unconsolidated and therefore easily removed by stripping. The clay is of good quality and satisfactory for the uses enumerated. The difficulty is to produce and ship cheaply enough to meet the competition of foreign clays which are brought over as ballast. In good years, this has been possible, but during periods of depression or lessened demand and lower prices, it has been difficult, because as the volume of the clay mined decreases, the cost of production per ton increases.

In the present economic life of the Purchase, clay mining does not play a major part. Except at Pryorsburg, the pits are small and afford employment for only a few men. Further, the employment is seasonal in character, especially in the smaller pits. These smaller pits often afford off season employment for a few farmers. In part, the failure to develop the resource more fully probably results from the difficulty in overcoming the prejudice of manufacturers. Although tests show that Kentucky clays can be used successfully to replace foreign clays, as long as the foreign clays can be sold at or below the prices of Kentucky clays, it is difficult to displace them. This condition is probably temporary, and in case the clays have the properties and qualities which tests would indicate, their use should increase materially.

BRICK MANUFACTURES

At different times, brick has been made at Paducah, Mayfield, Murray, Hazel, Bardwell, Fulton and possibly at other places as well (3a). In 1905, there were eight brick plants in operation, three at Paducah, two at Mayfield, and one each at Bardwell, Fulton, and Hazel (3a). During the summer of 1921, there were only four: two at Paducah, the Paducah Brick & Tile Company and Hill & Karnes; one at Mayfield, the X. B. Wickersham Company; and one at Fulton, the G. H. Bransford & Son's plant. Of the four, only Hill & Karnes and G. H. Bransford & Son's were among the eight which were in existence in 1905.

The clay which is used in making the brick is obtained by removing the surface soil and utilizing the underlying clay of the Columbia formation. As this formation is widespread, it is possible to obtain the material to manufacture brick in most portions of the Purchase. Markets are necessarily local, and as brick construction is not general, the market for the output is restricted. These facts explain the withdrawal from the field of so many companies and the frequent changes in ownership and location of the plants.



Plate LXVI. The X. B. Wickersham brick plant at Mayfield.

The Mayfield plant is typical and will serve to illustrate the size of the plants and the volume of production. The plant, which was built in 1908, has five kilns, with a total capacity of 1,750,000 bricks per year. The bricks produced are loaded directly on cars. Wood is used as fuel for drying, but coal is utilized to burn the bricks. The product is a red face brick which is marketed locally in western Kentucky and Tennessee.

The Fulton plant, which has a capacity of 5,000,000 bricks per year, uses coal as fuel. Although not in operation during 1921, it was expected to resume production in 1922. The bricks are not as good as the Mayfield product, the clay being inferior. The Paducah plants each have an annual capacity of about 7,500,000 bricks and likewise utilize the surface clay as a source of material.

The plants vary considerably in capacity. The Paducah plants are largest because the local market absorbs a large output; the Fulton plant represents an excess capacity with consequent periods of non-production; the Mayfield plant produces to capacity. Construction is changing in character in the Purchase. The log house has already given way to frame construction, and with the steadily mounting prices for lumber, brick is coming into use in the newer and better houses in the towns. This should lead to a better demand and a wider market for brick, so that brick manufacture should lose some of the precariousness which has attached to the industry in the past.

POTTERIES

The largest pottery in the Purchase, and the only one in Paducah, is the Paducah Pottery Company. Various kinds and sizes of Bristolware, stoneware, and flower pots, together with numerous other articles of similar character, make up the out-



Plate LXVII. The plant, the employees and the product at the Pottertown Pottery.

put. The clays from which these articles are manufactured are secured at various places, a considerable quantity coming from Graves County. The other potteries are small, and the process of manufacturing, crude. Only in the Paducah plant is the method of manufacture modern and the output of considerable volume.

At various times, potteries have existed at Pottertown, Bell City, Water Valley, Mayfield, Columbus, Wickliffe, and south of Lynnville. (3b) Of these, the ones at Pottertown, Bell City and Wickliffe were in operation during the summer of 1921.

Potteries represent one of the earliest forms of manufacturing enterprise in the Purchase. The Pottertown Pottery was opened about 1840 and the potteries at Bell City and Wickliffe were likewise started at an early date. Their combined kiln capacity is 15,000 gallons and the annual production about 360,000 gallons. Except at Wickliffe, wood is used as fuel. Plate LXVII shows a plant and the product. In these small plants, manufacturing methods are crude. The clay, which is obtained close at hand, is ground by horsepower as shown in Plate LXVIII and the churns, jugs, crocks and similar articles are produced on one or two wheels which, at the Pottertown plant, are driven by hand.



Plate LXVIII. Grinding clay for the pottery at Wickliffe.

These potteries produce a cheap, heavy product, not well able to stand transportation costs for considerable distances, consequently markets are local. The industry, except at Paducah, does not employ many men. Plate LXVII shows all the employees at the Pottertown Pottery, which is representative for the three small plants. At Paducah, where production is on a much larger scale, the industry affords employment to about

120 men. Statements by the operators of the smaller plants would lead the writer to believe that the output is not at present sufficiently great to satisfy local needs, in which case, an expansion of the industry is probable. This expansion is most apt to occur at Paducah because of more modern and economical methods of manufacture which secure a more scientific mixing of clays, smaller labor costs, less breakage in the kilns and more efficient marketing. The manufacture of this cheaper earthenware, however, does not promise to occupy an important place in the industrial development of the Purchase.

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CHAPTER XI.

POPULATION AND WEALTH

POPULATION

The total population of the Purchase in 1920 was 151,463, or the average density was slightly more than 63 to the square mile as against a state average of 60.1. If incorporated places with a population of 2,500 or more are deducted, the rural population shows an average density of 49 to the square mile as compared with a state average of 44.3 and a national average of 16.6. The density of population increased uninterruptedly from the time of the purchase of the territory to about 1910. Between 1910 and 1920, the population was practically stationary, the rural districts witnessing a loss which was nearly balanced by a gain in the cities. The growth of population for each county by decades from 1830 to 1920 is shown graphically in Fig. 31. The numerical increase in rural population which continued in all counties up to 1910, and to 1920 in a few counties, is a remarkable situation in an old settled area. In other older sections of the United States, the farms have lost in population to the cities, but in the Purchase, the crops raised have admitted of subdivision of farms and a retention of the natural increase of population by the rural communities. Additional factors effective in bringing about this condition have been the relative isolation of the area and the conservatism of the population. The last census appears to show saturation of the rural areas with people.

All that portion of the population residing outside of incorporated places with a population of 2,500 or more is defined as rural. Prior to 1850, there was no urban population under this definition. Paducah passed the 2,500 mark shortly after that date, Mayfield became an urban center between 1880 and 1890, Fulton between 1890 and 1900, and Hickman between 1900 and 1910. Since then, no additions have been made to the list. In 1920, the urban population constituted only 24.6% of the total population as compared with a state average of 26.2%. Although Kentucky ranks only thirty-sixth among the states of

Numbers in parentheses refer to the chapter bibliography at the end of the chapter.

POPULATION BY DECADES 1830-1920

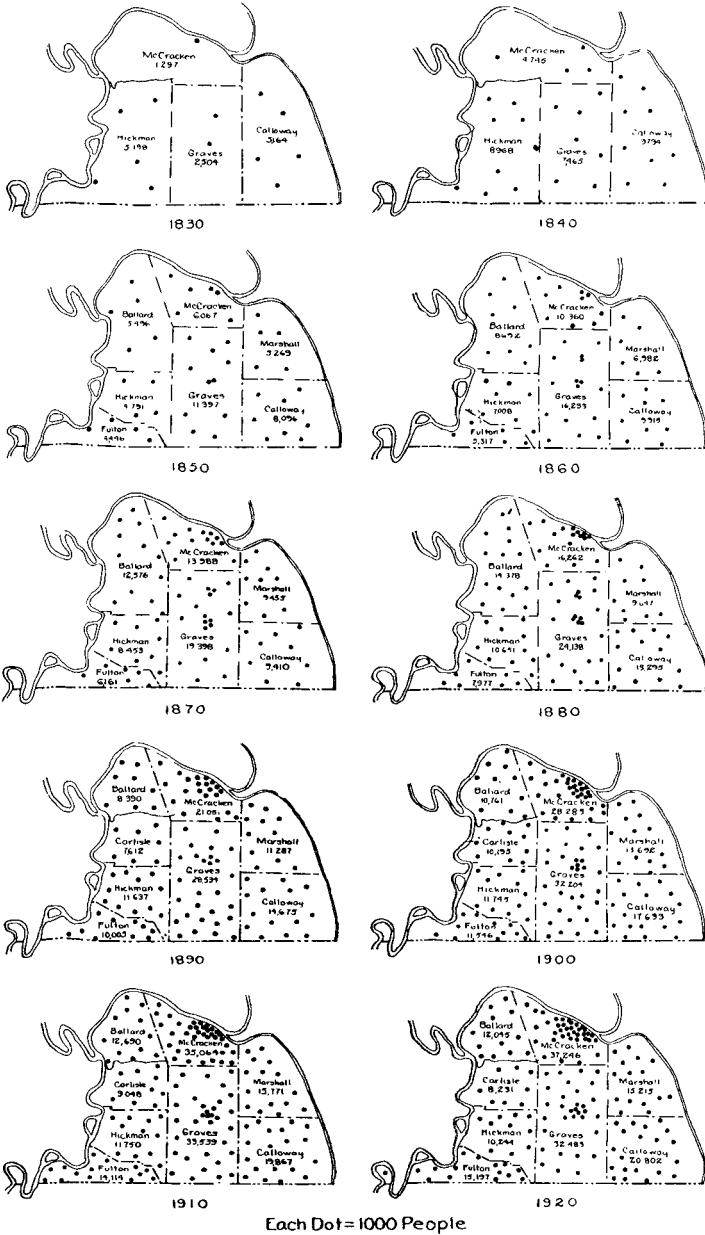


Fig. 31. Growth of population by decades.
Data from U. S. Census.

the United States in the percentage of its urban population, the Purchase falls below the state average and far below the national average of 51.4%. The urban population, however, is increasing, both in actual numbers and in relation to the total population. At the same time, the rural population is decreasing in five counties and increasing by very small percentages in three counties. Fig. 32 shows the actual percentage of increase or decrease in rural population for each county for the decades ending 1910 and 1920.

During the past forty years, the percentage of urban population has been slightly below the state average and far below the average for the United States. From 1900 to 1910, Kentucky as a state, together with Iowa and Nebraska, showed the smallest percentage of increase of urban population of any of the states in the United States. From 1910 to 1920, Kentucky was one of the thirteen states showing the smallest percentage of increase in urban population. The Purchase today is in the same position that Michigan and Indiana occupied about 1875 in the relation between urban and rural population, though each decade since 1880 has witnessed locally a decrease in the percentage of rural population. In 1880, 91.7% of the population was rural; in 1920, the percentage had fallen to 76.4%.*

Factors contributing to the present decline in the rural population of the Purchase are the same as elsewhere in the United States. The delay in the beginning of the cityward movement of the population was the result of the retardation of the area. The decrease in the rural population is closely related to the decrease in the amount of improved land, which is most apparent in those counties which are losing in rural population. Long cultivation of the soil, continuous cropping and unchecked soil wash show their effects. Another important factor contributing to the loss of rural population is the general loss in economic and social attraction of the farms as against the cities. Living conditions are hard on the average farm in the Purchase, consequently, as the members of the younger generation have grown up, they have drifted to the cities. Conditions of rural life are improving, it is true; the log house is slowly disappearing;

*Changes in urban population and the reasons therefor are discussed in Chapter IX.

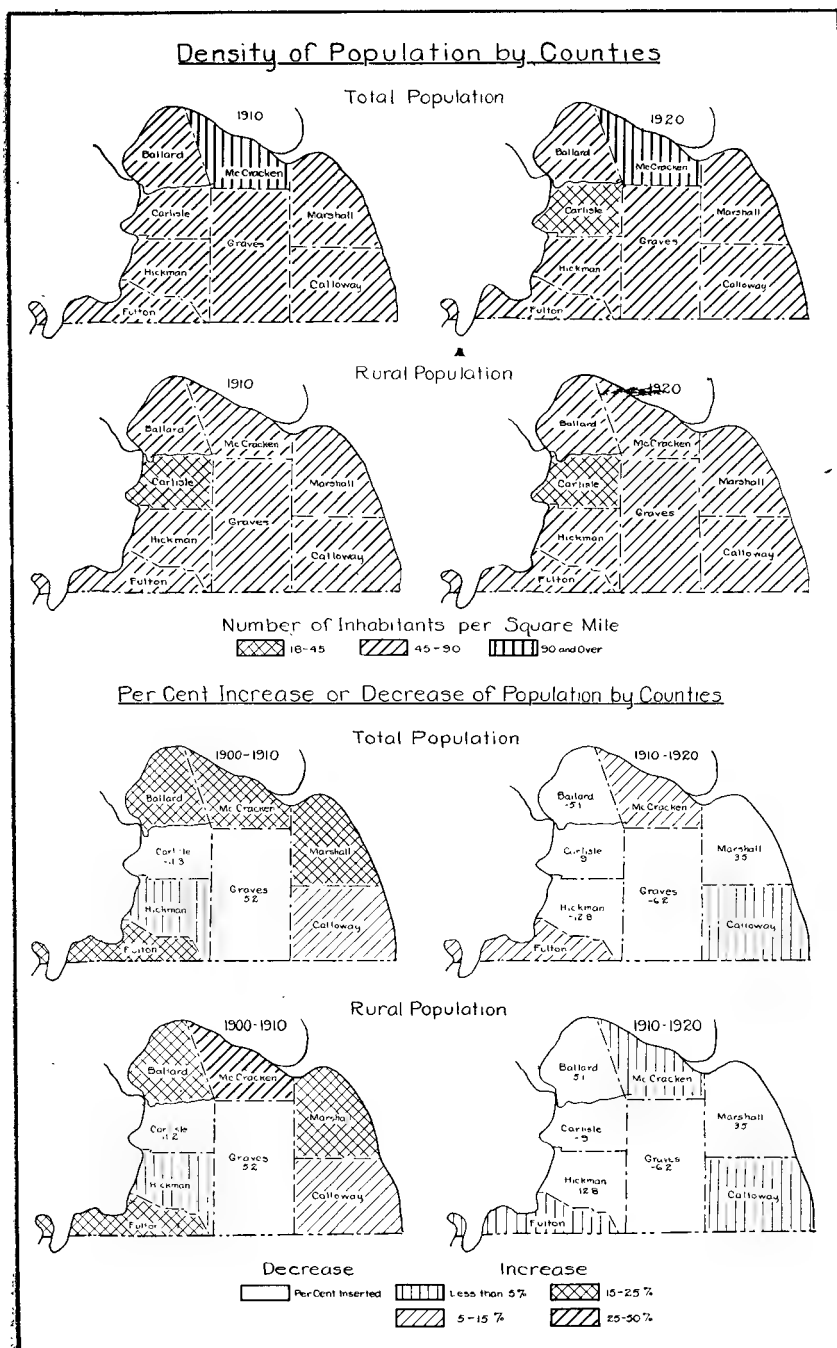


Fig. 32. Density of population and percentage of increase and decrease of population, by counties. (Data from U. S. Census.)

modern conveniences are finding their way even into the more isolated areas; the mails put the farmer in touch with the outside world, but the change is occurring altogether too slowly to retain the young people on the farms. During much of the year, the roads are still virtually impassable and the farmer is cut off from the outside world by seas of mud almost as effectively as he would be by seas of water on an oceanic island. The construction of good roads would remedy this condition and would remove the barrier which poor roads erect to prevent the more rapid penetration of improved farming practice and the introduction of the conveniences of modern life in the homes. Under the present condition of the roads, which limit the farm economy and compel the persistence of a pioneer type of agriculture, no gain in the rural population can be expected.

The early settlers in the Purchase were virtually all of American birth and American parentage and mostly from southern states. Of a list of 483 early settlers of Graves County, selected at random, 96% were born south of the Ohio and east of the Mississippi River. Only 13 were from northern states and only 6 were foreign born. Of the settlers from the northern states, the majority were merchants, manufacturers or professional men.* Virtually the same condition prevailed at an early date over the entire area, except that there was a slightly larger admixture of northern settlers and a larger percentage of foreign born population along the Ohio and Mississippi rivers, especially around Paducah and Hickman (2). Among the foreign born, Germans were most numerous. In 1860, the foreign born population of McCracken County constituted 10% of the total, in Fulton County 4.8%, but in Calloway County .2%. At no time since the settlement of Calloway County has its percentage risen above this figure. In 1920, only two counties had more than .1% of foreign born population and these two, McCracken and Fulton, had 1.3% and .5% respectively. Essentially, the white population is of native birth and native parentage (2). The appended tabulation shows this characteristic of the population.

*County Atlas of Graves County, published in 1860.

NATIVITY OF POPULATION OF THE PURCHASE 1920.

COUNTY	Native white	Native white native parent-age	Native white foreign parent-age	Native white mixed parent-age	Foreign born white
Ballard	10,643	10,549	22	72	16
Calloway	19,766	19,721	9	36	8
Carlisle	7,917	7,826	15	40	3
Fulton	11,905	11,680	111	114	42
Graves	29,841	29,694	61	86	42
Hickman	8,983	8,908	28	47	13
McCracken	29,890	28,252	846	792	349
Marshall	15,148	15,098	19	31	3

Data from U. S. Census.

Native whites of native parentage today constitute 98.2% of the total white population. Of the foreign born and native whites of foreign parentage, 70% live in McCracken County. Since about the time of the Civil War, the percentage of foreign born, slight even then, has been decreased steadily by cessation of immigration. The result of the small admixture of northern settlers and the absence of any appreciable percentage of foreign born population has been to produce a population of extraordinary homogeneity.

It is necessary to keep this characteristic of the population in mind, as well as the fact that the people have come almost entirely from southern states, to understand many of the characteristics of the area. It explains in part the nature of the crops produced, especially the growing of tobacco and the predominance of corn as a cereal crop; it has determined the type of architecture of the log house and the more pretentious farm dwellings with their two-story porches; it is responsible for the towns built around the courthouse square and it may be accountable for the philosophy of life which confronts one south of the Ohio. The small southern farmer in large part has never devel-

oped into a commercial producer, but has been content to maintain the practice of self-sufficiency in his operations.

Incoming population from southern states filled up the territory, only a few stragglers drifting in from the northern states; the Purchase was settled prior to the great tide of European immigration from 1850 to 1880. As time passed, population increased in the natural way, while deaths decreased the small percentage of foreign born. About 1910, the natural increase began to exceed the developed resources of the area, since which time, there has been considerable emigration. It is believed that this will shortly cease as the area readjusts itself to present conditions and industrial centers develop which will afford employment for the surplus population of the farms as well as furnish markets for a greater variety and greater quantity of farm products, thereby enabling the land to support a denser population. No new elements have been introduced into the population for many years, so that except in Paducah, the attitude of mind of the inhabitants remains unchanged. The development of a critical attitude toward existing conditions would go far toward starting the area on the path toward a solution of its manifold problems.

Aside from native whites, the other important element of the population is the negro, who makes up 11.1% of the present population as against a state average of 9.8%. In 1860, negroes constituted 16.5% of the population and were distributed rather evenly among the counties of the Purchase, except in Marshall County, where there never have been many negroes. Between 1860 and 1900, although the negro population nearly doubled, the percentage of negroes decreased from 16.5% to 14.1%. During this period, the negro population also became concentrated in greater part in McCracken, Graves and Fulton counties, these three counties containing 69.6% of all the negroes in the Purchase. At present, the negroes are found in the larger centers of population and in the cotton growing districts. Except in McCracken and Fulton counties, and to a much lesser extent in Graves County, the negro is not an important element in the population. Since 1900, negroes have decreased in number in every county, both in actual numbers and relative to the total population. In 1920 two counties, McCracken and Fulton, had

60.6% of the negro population of the Purchase. The decrease in the number of negroes was most marked between 1910 and 1920, though not confined to that decade.

The decrease is attributable to two causes. Industrial development in northern states has caused a great outflow of negroes from the south, many of them leaving Kentucky. The second cause for the migration of the negro has been his inability to find a place in the post-bellum farm economy of the Purchase. In Fulton County alone, where cotton is grown on a large scale, does the negro find a place. In the other counties, negro farm labor cannot be utilized effectively. Farms are small; the crops raised are of such a character that the labor is distributed over the year and is performed by the farmer and his family. Under such conditions, the negro finds no place. Only in those counties of larger land holdings and an extensively developed tenant system, are there large numbers of negroes on the farms.

In the cities, there is again a concentration of negro population, this being particularly noticeable in Paducah, Mayfield and Fulton, where opportunities for employment in domestic service, as roustabouts in railroad shops and river work, and in casual labor are greatest. As an illustration of the tendency to collect in cities, nearly 80% of the 7,006 negroes in McCracken County are in Paducah. As a component of the population, the negro is at present of decreasing importance, and in the rural districts, except in Fulton County, promises to become even less important. In the cities, there will probably always be an appreciable percentage of negroes in domestic service and occasional labor.

WEALTH

The Purchase, which comprises 5.7% of the area of the State, contained 5.92% of the State's total taxable wealth in 1920.* McCracken County heads the list both as to total assessed valuation and valuation per square mile. Fulton County ranks second in value per square mile, whereas Marshall County foots the list. McCracken with 26% and Graves County with 23.5% of the total taxable wealth, together represent half of the total

*Report of the State Tax Commission for 1920. (5)

taxable wealth of the Purchase. This concentration of such a large fraction of the total taxable wealth in these two counties is due to the wealth in Mayfield and the areal extent of Graves County and the wealth in Paducah and its immediate vicinity.

TAXABLE WEALTH IN THE PURCHASE 1920.

County	Total Taxable Wealth	Taxable Wealth Per Square Mile	Taxable Wealth Per Capita
Hickman	\$8,740,489	\$38,846	\$853.23
Carlisle	6,105,781	30,837	741.80
Ballard	8,713,445	34,577	723.40
Calloway	11,257,490	27,324	541.17
Marshall	6,937,899	21,216	455.99
McCracken	27,855,134	116,584	747.86
Graves	24,766,236	45,120	762.43
Fulton	10,687,492	55,375	703.26

Data from report of the State Tax Commission for 1920.

If McCracken, Graves and Fulton counties, which show high per capita wealth largely because of the prosperity of their cities are excluded, the assessed valuation of all taxable wealth per square mile, as well as the wealth per capita, represents quite accurately the desirability of the different areas for agricultural use. This shows clearly in the preceding tabulation. The counties in the Cane Hills lead, next follow those in the Barrens, whereas the counties in the Breaks of the Tennessee foot the list.

Differences in assessed valuation per square mile, ranging from \$21,216 to \$38,846 in the counties without urban population, reflect the differences in opportunity afforded by the environment and will always persist to a great extent. When the situation is analyzed farther, however, it becomes apparent that if the state is to be a prosperous concern, functioning efficiently, each county should, as far as possible, pay its fair share toward supporting the state; each county should be an asset, not a liability. In the case of counties which receive as much from

the state in the form of money for the support of the common schools or for the construction of roads as they contribute in the form of taxes, it is apparent that some other county with a higher assessed valuation makes up the deficit. In the Purchase, Marshall County affords an example of such a condition. The total revenue received by the state (or to be paid) from the county for the year ending June 30, 1920, on the assumption that all taxes were paid, was \$27,970.38. The state returned to Marshall County \$27,501.80 in money for the support of the common schools in the same year. The Auditor of Public Accounts reports expenditures in Marshall County in 1920 as exceeding receipts by \$3,935.11, and in Calloway County, by \$3,735.58. (1) Such counties of limited resources and low assessed valuation contribute little or nothing to the support of the government of the state, the state educational institutions, or other state enterprises.

Insofar as this condition cannot be remedied, it must persist; but in cases where it is merely due to retardation and a failure to develop the resources which do exist, it is not only a problem which confronts the individual county, but the state as well. A member of the family of counties is not doing its share. An adequate classification of lands and opportunities is needed so that every square mile may be used most effectively. This is distinctly not a county enterprise, certainly an undertaking for the state, and possibly for the nation.

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CONCLUSION

In the Purchase, readjustment of population has failed to correspond to the usual migration from farm to town. This is one of the most distinctive characteristics of the area. Normally, internal movement of population in the United States is into the larger local centers of population, and in case the attraction of these is not great, into urban districts in other parts of the country. In both these respects, the area has witnessed a displacement of population that is far below the normal for the country. As the result, the economy of the area has been and is being modified in the direction of smaller farming units and crops suited thereto, again in a manner divergent from that of the country at large. This phenomenon is hardly to be explained by physical conditions, certainly not by physical isolation. Its explanation appears to lie in the preference of the population, in a measure in a lack of sensitiveness to economic forces.

The Purchase was the last part of Kentucky to be occupied, but by 1850, within thirty years after the area was opened to settlement, the density of the rural population was only a trifle less than the state average. By 1860, the average rural density was 25 to the square mile and the total average density was practically equal to the state average. Shortly after 1860, the Purchase passed the state average and has since widened the gap, especially as regards density of rural population. Such a rapid occupation of the land by settlers drawn principally from southern states, and in large measure from other portions of Kentucky, argues for a superior initial attractiveness of the area to the early settlers who, in larger part, came from the less desirable sections of Kentucky and other southern states.

Movement into the Purchase, which was prior to the construction of railroads, was either overland or by way of the rivers. Within less than twenty-five years after the initial settlement, seven out of the present eight counties had been organized, and by 1850, only Marshall County had a density of population as low as 16 to the square mile. All counties had enough desirable land to attract settlement, but some sections contained larger tracts more suitable for development because of accessibility, soil, topography or native vegetation. The loess covered

uplands, which are of high fertility and easily accessible from the Mississippi River, were among the first areas to be settled. The same was true for the Barrens and the Flatwoods, where extensive tracts of level land, with fair to good soil, ready for the plow without any clearing, were especially attractive to the pioneers. In the Oak and Hickory Hills, and in the Breaks of the Tennessee, settlement early pushed up the creeks and occupied the small bottoms. The Big Bottoms were among the last of the areas to be occupied. Even today, these bottoms contain the largest remnant of unoccupied land, even though highly productive, as the practical difficulty of drainage discourages individual enterprise. The timbered hilly uplands and the heavily timbered bottomlands of the larger streams were not occupied until a late date, the forest resource not proving an attraction until subsequent to 1880.

After the initial movement of population into the area, no further immigration of appreciable extent occurred, expansion of population resulting from natural increase. With increasing population, urban centers sprang up, in some cases county seats, in others, market towns. Paducah, because of its superior location, early assumed the dominant position which it still retains; Hickman, an old river port, has gained only slightly in population; Columbus has lost ground. Mayfield and Fulton became important with the coming of railroads. Other minor centers, as Murray, Hazel, Benton, La Center, Wickliffe, Bardwell and Clinton owe their importance, in part at least, to the railroads.

Population early exerted pressure on the land so that the more undesirable poorly drained bottoms and timbered slopes were gradually brought into use. With continued use of the land, initial differences in desirability were accentuated. In the more level portions of the western half, after the clearing of the land, the loess area and the bottom lands under levee developed into very desirable agricultural areas, and the same was true for the more level portions to the east where the soils are only fair, but where topography is such as to admit of successful cropping of the land. These areas have made consistent progress since the date of settlement, the amount of progress being in almost direct proportion to the desirability of the land for agricultural use. In these areas, there is the greatest amount of railroad

development, agricultural prosperity is at a maximum, and in these sections are the only urban centers in the Purchase. In the better portions of this area, transportation facilities are adequate and industrial development is beginning. Although the inhabitants are conservative and possessed of an exaggerated idea of the character of present achievements, these areas are far from backward.

Stagnation, however, if not actual retrogression, is prevalent over a large fraction of the Purchase. Contrasted to the more desirable western portion, is the hilly eastern third with the outlying hilly extensions along the stream courses penetrating westward into the more level lands. With the exhaustion of the timber, the steep, easily eroded slopes with their thin soils early lost any original desirability which they may have possessed. Today, these are sections of great poverty where the inhabitants wring a bare existence from the few acres of bottom land along the creeks. One of the most striking features of the Purchase is the abrupt changes in living conditions which occur within short distances. These contrasts are today more emphatic than they have been in the past and continue to be emphasized more.

Except in limited portions of the western counties, agriculture is for the most part rather specialized, and the specialization has been of such a character as to make doubtful the future agricultural prosperity of parts of the area. The principal staple crops involve clean cultivation and lead to a rather rapid exhaustion and removal of the soil and also leave it in poor physical condition. Even in the fertile lands of the Mississippi bottoms below Hickman, continuous cropping has produced a noticeable effect. One of the results of this agricultural practice, aside from its direct effect upon the soil, is that at least 10% of the land has been damaged by erosion and 3% has been destroyed. Diversification of crops and a system of crop rotation will be necessary if the Purchase is to retain its present relative position in the agricultural column. The selection of the particular crops which can be grown to best advantage will require careful experimentation and the crops will vary in different portions of the Purchase. Whatever crops are grown, there should be an expansion of the animal industry, without

which no permanent type of agriculture can be developed under American conditions.

In the hilly counties of the eastern third of the Purchase, where slopes are steep and soils are thin, the farmers cannot successfully compete with the farmers of the more level areas in the growing of grain. It is necessary in such areas to establish an animal industry or face pauperization of farming, if not its extinction. There is a sufficiency of creek and river bottom to produce winter feed and the hills should afford permanent summer pasturage. The chief difficulty is to obtain a satisfactory pasture grass which will grow well in the lime deficient soils and stand grazing during the summer droughts. Great differences of opinion exist as to the desirability of the different forage plants, but the opinion is general that Japan clover can succeed under these conditions, as it has demonstrated the fact by volunteer growths. With the development of satisfactory pasture grasses, the agricultural problem of these hilly areas would seem to be largely solved. With the development of permanent pastures, much land would come into use which has been idle and practically valueless since the removal of the forest cover. These pastures in the hilly areas would supplement the fertile grain lands farther to the west. In these areas, although at present sheep are few in number, opportunity seems to point to their increase in number in the farm economy of the future. The value of the poultry products should also show a great increase with a more intelligent utilization of the possibilities. Although apple orchards would doubtless do well in the hilly uplands on the deforested slopes, the lack of effective marketing organizations and transportation facilities will deter extensive planting in the more remote portions of the hilly section and confine the industry to those portions where it is already slowly establishing itself in the vicinity of Paducah. Even after all the land which is available for use as plow land and permanent pasture has been put to its best use, there will still remain thousands of acres in the hilly upland where the slopes are too steep or the soils are too thin to be used successfully in any way except for the maintenance of a forest cover. Forestry is not practiced at present, any growths which occur being volunteer growths, often of undesirable species. With proper

care, these hilly areas would contribute a steady supply of oak and hickory, which in years to come would be a resource of great importance in view of our rapidly diminishing national supply of hardwood. This portion of the Purchase is in a critical condition; standards of living are falling; overpopulation is a fact.

In the more level portions of the loess area and in the Barrens, conditions are essentially stable. Farming is not threatened, the problems which confront these sections being those of American agriculture in general. In these sections, diversification of crops and the establishment of an animal industry would go far toward solving the problem of farm economy. Clover will grow without liming in the loess area, so that the problem of a forage crop is not acute. By a more intelligent use of the land, it will be possible to raise the standards of living and at the same time make it possible for the land to support an increasing population. The solution of the problem lies in the effective use of the land in the production of crops of high unit value, in the effective marketing of such crops, and in the growth of nearby centers of consumption. Urban and rural development are mutually interdependent; the future of the rural community is inseparably tied up with urban prosperity. Increased industrialization means better markets and better prices for the products of the farm and insures increased prosperity for the rural population. This means in turn increased purchasing power for the farmer and an increased market for the products of the factories and assures good times in the cities. Intelligent appreciation of the dependence of one upon the other will mark a step forward in an understanding of the situation. In Paducah, there is a distinct realization of this interdependence of city and country and an active desire on the part of the city to advance the agricultural practice of McCracken County, although the rural prosperity of McCracken County will play only a minor part in the future of Paducah.

Two pressing problems confront the Purchase, the gravity of which can hardly be overemphasized. One is the question of soil erosion, to which frequent allusion has been made. The loess area is relatively exempt, because of the texture of the soil, and the bottoms and more level portions of the Barrens and Flatwoods are not badly eroded because of the topography, but no

areas are entirely exempt from the effect of the erosion which occurs on the steeper slopes, as deposition of material frequently ruins fields which are not subject to damage by erosion. Unless soil erosion is checked, retrogression is certain. A second problem is the almost universal lack of good roads. Statements which have been made as to the roads are understatements rather than exaggerations; true agricultural prosperity will never arrive until roads improve; it is impossible to conceive of an intelligent, satisfied farming community under present conditions. Agriculture must, under present conditions as to roads, be largely devoted to the production of pioneer type crops, corn and tobacco, and the result must be the same as it has always been where these two crops have been raised to the exclusion of all others.

No startling changes can be predicted for the area. The Purchase will probably remain essentially rural in character, except for limited industrial development at Paducah. The exploitation of the deposits of pottery clays and other mineral resources does not promise to alter materially the economic situation. The area, however, is on the verge of change. If improvements in farm practice do not occur, retrogression is certain. This is distinctly a critical period in the history of the Purchase. The next thirty years will decide the position which the Purchase is to occupy for many years thereafter. To head the area in the direction of improvement is vital; neglect to do so will result in a retrograde movement.

Though the problems have been stated and the weaknesses of the present situation have been emphasized, it should not be inferred that the future for the Purchase is necessarily dark, as the truth should be very much the opposite unless poor judgment is used in the utilization of the great natural resources of the area. In many portions, the soils are of high fertility and capable, under scientific handling, of producing abundantly for all time. The pottery clays are an asset of great value and promise much for the future. Nature has endowed the Purchase liberally; man, by avoiding a wasteful use of these resources, can conserve this inheritance indefinitely. The criticisms which can be directed toward the Purchase are criticisms of man's activities in the area, not of the opportunities afforded by the

environment. The people are essentially of American stock, hospitable, courteous and obliging, and intensely patriotic and interested in civic affairs. Hampered by conditions beyond their individual control, they are often prevented from achieving what their natural ability would allow. By development along proper lines, some of which have been indicated, the Purchase will be enabled to support a denser population than at present under much better living conditions than now exist. A neglect of the lessons taught by the failures of the past will be disastrous to the area. The time is peculiarly critical and the inhabitants of the area cannot long defer an appraisal of the situation without imposing a serious handicap on the future.

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